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PRELIMINARY REPORT
ON
CERTAIN LIMESTONES AND DOLOMITES
OF
BERKS COUNTY
PENNSYLVANIA

By

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PRELIMINARY REPORT

ON

CERTAIN LIMESTONES AND DOLOMITES OF BERKS COUNTY, PENNSYLVANIA

By

Carlyle Gray

INTRODUCTION

Purpose and Scope

The primary purpose of this progress report is to present chemical analyses of 366 samples of limestones from Berks County together with brief descriptions of the localities from which the samples were taken. A discussion of some of the features of the stratigraphy and distribution of the limestones is included to facilitate the interpretation of the analyses and to aid further exploration for the more valuable beds.

The work is part of a broader program which will eventually result in a comprehensive report on the geology of Berks County. In the present report only certain limestones of the Ordovician system are considered. In Berks County, these formations are the principal source of stone, the use of which depends primarily on its chemical composition. Samples were collected from the Beekmantown, Annville, and Jacksonburg beds. Detailed mapping by the author has covered so far only the main outcrop belt of the Annville and Jacksonburg beds and adjacent parts of the Beekmantown and Martinsburg formation, and a small part of the Oley Valley. Nearly all of the operating and inactive quarries in the Beekmantown limestone and dolomite have been visited.

Only the analyses of samples collected during the present investigation are presented here. Additional analyses of samples of limestones from Berks County may be found in Volume D3, Second Geological Survey of Pennsylvania (D'Invilliers 1883), and in Bulletin M20, Pennsylvania Geological Survey, 4th series (Miller 1934).

Method of Investigation

The field seasons of 1949 and 1950 were spent in Berks County examining quarries, doing detailed geologic mapping, and collecting samples. Lithology and structure of the rock, size of the quarry, overburden, water conditions, and a rough estimate of economic potentiality were noted in the quarry examinations. This material is included in the locality descriptions presented in the appendix.

Mapping was done on a scale of 1:20,000, using enlargements of topographic maps and aerial photographs as a base. The points were located principally on the aerial photographs, and then transferred to the map using dividers. Because of the scarcity of outcrops, much of the mapping is based on tracing of float. Fortunately the float from the formations covered thus far is usually distinctive, and errors are more apt to be in extent of area underlain by a formation than in classification of the rock.

The samples were collected in two groups. Samples 1 - 235 were collected in October 1949 and samples 237 - 378 in September and October 1950. The localities sampled were chosen to represent the formations as fully as the limited exposures would allow. Localities with a maximum of stratigraphic thickness exposed were preferred. In general only fresh rock was taken, but in some cases slightly weathered material was included. Except where intimate interbedding of types made it impossible, each lithologic type was sampled separately. The length of the sample was measured perpendicular to the bedding and represents stratigraphic thickness of the interval sampled. Each sample was composed of chips taken at regularly spaced intervals. Regardless of the length of the sample interval, the volume collected was approximately the same for each sample. The chips were, therefore, more closely spaced in the shorter samples than in those of greater length.

Laboratory Work

The samples were crushed and split in the geological laboratory at Lehigh University by student assistants under the direction of Professor H. R.

Gault. The chemical analyses were done in the laboratories of the Bethlehem Steel Company and the Allentown Portland Cement Company.

In order to present graphically the analyses of the samples, a number of contoured triangular diagrams have been prepared (figs. 2 - 7). The method is similar to that used by Gault (1950). The diagram is so constructed that the upper angle of the triangle represents 100 per cent CaCO_3 , the lower right-hand corner 100 per cent MgCO_3 and the lower left-hand corner 100 per cent insoluble constituents, i.e., silica, alumina, and iron oxides. Any limestone (or dolomite) analysis which adds up to 100 per cent can be plotted on the diagram as a single point, whose distance from each corner represents the percentage of that constituent. Figure 1 shows the fields occupied on such a diagram by the various types of carbonate rocks.

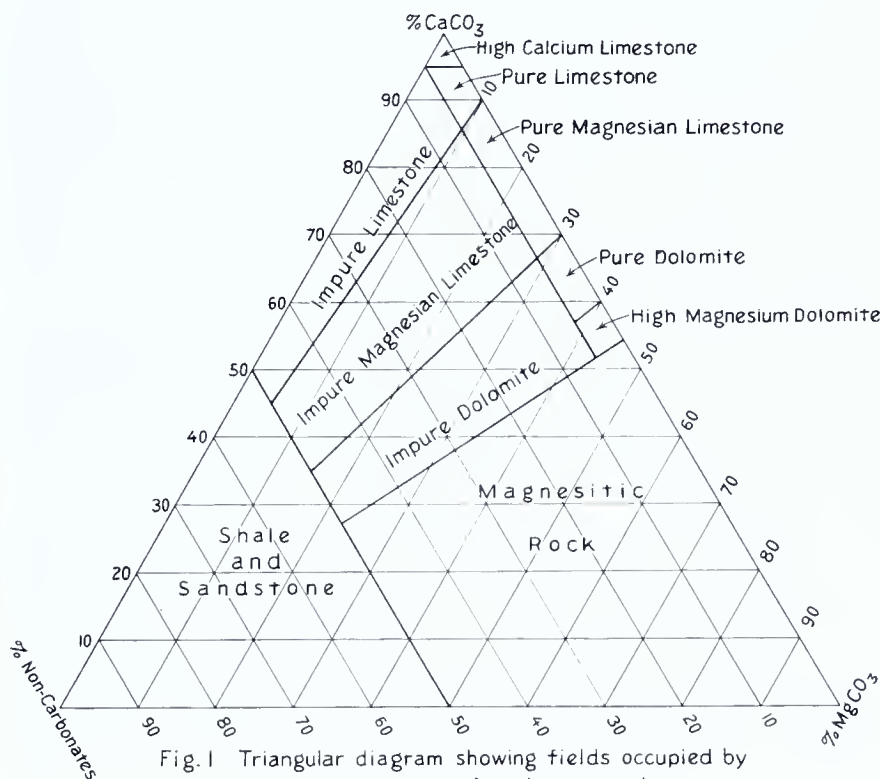


Fig. 1 Triangular diagram showing fields occupied by the various types of carbonate rock

As an initial step in the preparation of Figures 2 - 7, points representing analyses of samples from each of the stratigraphic units were plotted on six separate triangular diagrams. To emphasize the grouping and distribution of the points, a statistical analysis was made in the following manner. A hexagon, having an area of 0.5 per cent of the area of the triangle, was moved in steps across the point diagram. The number of points falling within the hexagon was recorded at its center at each predetermined interval. The entire area of the triangle was covered in this manner. Each recorded number was then converted to the percentage of the total number of points (analyses) plotted on that diagram, and lines were drawn through points of equal percentage. The meaning is best explained in the terms of an example. In Figure 2 the area between the 15 and 25 per cent contours is represented by vertical shading. If the center of the hexagon is placed anywhere in this shaded area, between 15 and 25 per cent of the analyses plotted for the lower limestone member of the Beekmantown limestone and dolomite will fall within the hexagon.

It is believed that these diagrams are useful in indicating the economic potentialities of the stratigraphic units considered in this paper. For example, a comparison of Figures 2 and 6 shows that even the purest of the Beekmantown limestones do not show as high a calcium content as does the Annville limestone.

Acknowledgements

The author wishes to express his gratitude to the Bethlehem Steel Company and the Allentown Portland Cement Company for their coöperation in performing the chemical analyses. Without their help, it would not have been possible to carry out so extensive a program at this time. This aid was arranged by Professor H. R. Gault of Lehigh University, who also has supplied many helpful suggestions on field procedure. Professor C. E. Prouty of the University of Pittsburgh, a coöperating geologist of this Survey, has contributed much to the writer's understanding of the stratigraphy of the Annville and Jacksonburg formations. His generous contribution of time for field conferences

and of unpublished information is much appreciated. Mr. John Joyce and Mr. Lee Fulton assisted in the collection of samples.

STRUCTURAL GEOLOGY

The structural geology of the rocks under consideration is exceedingly complex in detail. It is beyond the scope of this paper to present more than the general structural pattern. The map (pl. 1) was prepared primarily as an index to the sampled localities, and therefore very little structural information could be plotted on it. Furthermore, the map was compiled from various sources and therefore lacks uniformity of detail. The outcrop areas of the Jacksonburg formation and Annville limestone are the result of detailed mapping by the writer. The contacts mapped are shown as solid and dashed lines. The distribution of the older limestones, indicated on the map by dotted lines, was taken from manuscript maps by E. T. Wherry and G. W. Stose, on file in the office of the Pennsylvania Geologic Survey.

The principal limestone areas of Berks County underlie the lowlands on the northwestern flank of the Reading Hills uplift. The uplift is essentially a much faulted anticlinorium, which has brought to the surface the basal Cambrian quartzite and pre-Cambrian metamorphic and igneous rocks. The present elevation of the Reading Hills and the Wernersville South Mountain (a related structure) is due to the superior resistance to erosion of these crystalline rocks over the limestones and shales of the lowlands.

The regional dip on the flank of the anticlinal uplift, as indicated by the distribution of the stratigraphic units, is to the north and northwest, but the majority of dips observed in the field are to the south and southwest. This is because the limestones are thrown into tight overturned folds. Detailed mapping has shown that, in addition to the tight folding, thrust faulting is a common feature. The largest thrust mapped during the present investigation lies between Robesonia and Wernersville and brings the upper Cambrian beds to lie on the middle Ordovician Annville limestone. The stratigraphic throw of this fault is between 1000 and 2000 feet. The map (pl. 1) shows this and several other

large-scale thrusts. Tear faults are associated with nearly all of the thrusts mapped.

The strike of the fold axes, and therefore regional strike of the bedding, is due east to north-east. The folds are all overturned to the north and northwest, and the thrusts move in the direction of overturning of the folds.

Minor structural details are strikingly well-developed in some quarries and are sometimes of importance to quarry economics.

Cleavage is noted only where particularly well-developed, as in the shaly limestone of the Jacksonburg formation. More or less faint indications of cleavage locally present in the Beekmantown limestone beds are useful in telling top and bottom of the beds, but accurate strike readings usually cannot be obtained.

Boudinage structure is seen where thin (6 inches to 2 feet) beds of dolomite occur in limestone. Under strong pressure the more brittle dolomite has broken into segments and the limestone flowed into the cracks. Viewed in section the dolomite beds resemble linked sausages (boudins, fr.). The structure is indicative of strong deformation.

Drag folds, ranging in size from crinkles in the laminations of the limestone to folds with several feet of amplitude, are commonly seen in quarry exposures. Small thrusts are also exposed in some quarries. The drag folds and small thrusts seen in the quarry faces can to some extent be regarded as scale models of the regional deformation.

In summary the structure is typified by complex folding and faulting. Repetition of beds through folding and absence due to thrust faulting add to the difficulty of unravelling the stratigraphy in a region of limited natural outcrops.

STRATIGRAPHY

General Statement

The stratigraphy of the beds sampled — Beekmantown, Annville, Jacksonburg — is discussed here to help the reader in interpreting the results of the sampling. It should, therefore, be emphasized that the proposed break-

down of the Beekmantown limestone and dolomite is tentative. The reader is cautioned to consider the "members" as lithologic types within the formation rather than as definite stratigraphic units. The Jacksonburg formation, applied broadly here, will be restricted in a forthcoming paper by C. E. Prouty.

The formations indicated on the map (pl. 1) are:

- Ordovician
 - Martinsburg formation
 - Jacksonburg formation
 - Annville limestone
 - Beekmantown limestone and dolomite
- Cambrian
 - Undifferentiated limestones and dolomites

Only the Ordovician beds will be considered in detail in this discussion of stratigraphy. They have been tentatively subdivided into the following members:

- Jacksonburg formation
 - Basal conglomerate (locally)
- Annville limestone
 - Upper member
 - Lower member
- Beekmantown limestone and dolomite
 - Uppermost member
 - Upper limestone member
 - Middle dolomite member
 - Middle interbedded member
 - Lower limestone member

Of these members only the basal conglomerate of the Jacksonburg has been differentiated on the map.

Beekmantown Limestone and Dolomite

Thickness and Correlation

Beekmantown fossils were first reported in the Coplay formation of the Lehigh Valley by B. L. Miller (1911, p. 19). Thereafter the term Beekmantown gradually replaced the local name Coplay for the rocks lying between the Allentown formation and the Jacksonburg formation. The name was first applied in Berks County by Miller in "The Limestones of Pennsylvania" (Miller 1925). The present author has accepted the manuscript maps of Wherry and Stose as indicating the general distribution of rocks of this age. The thickness of the Beekmantown limestone and dolomite in Berks County has been stated to be

1000 - 2000 feet. (Swartz 1948; Willard and Fraser 1939; Miller 1925).

As an outgrowth of the current investigation, the author has made, on the basis of lithology, a tentative subdivision of the formation into five members, the limits of which are gradational. The utility of these members in detailed mapping has not yet been tested. It is possible that the five members described below do not represent the entire Beekmantown sequence. As a whole, the Beekmantown of Berks County consists of interbedded limestone and dolomite. The subdivisions are based principally on the relative proportions of the two types of carbonate. Individual beds of limestone, magnesian limestone, and especially dolomite are very similar throughout the sequence.

Subdivisions

Lower limestone member. The lowest Beekmantown beds examined are massive dolomite with lenses and layers of chert, but the basal contact of the formation has not been observed in this area. Above these beds occur thick, relatively pure beds of limestone, interrupted only by thin dolomites. These limestones are thick-bedded, laminated, dark blue, and dense. The laminations are black when fresh and stand out on weathered surfaces as brown silty ridges. Limestone of this type grades vertically and horizontally into a mottled rock containing streaks and patches of crystalline, brownish, frequently dolomitic material in a matrix of dense blue limestone. The streaks and patches appear to be fossil worm borings, or fucoids. On weathered surfaces the more crystalline material is brownish and stands out in low relief. Interbedded with both the laminated and the mottled limestone are thin beds of gray, finely-crystalline, massive dolomite, weathering creamy or buff in color and appearing browner than the limestones, which weather light-gray to white. A variation in the interbedded dolomite is the pinkish, more crystalline type noted at the Kirbyville Quarry (Locality 2). The upper part of the lower member is chiefly dolomite, with only occasional thin, pure limestone beds.

Middle interbedded member. This member is typified by a regular interbedding of dolomite with limestone or magnesian limestone. The dolomite

is gray, finely-crystalline, and usually massive, but a faint lamination is occasionally noted on the weathered surface. The limestone interbeds are blue, laminated or mottled. As contrasted with the lower member, the laminations of this member are locally thicker and more prominent, the mottling, where present, is much better developed, and the wormy aspect more distinct. Poorly preserved fossils, mostly gastropods, have been noted in mottled limestone beds of this member.

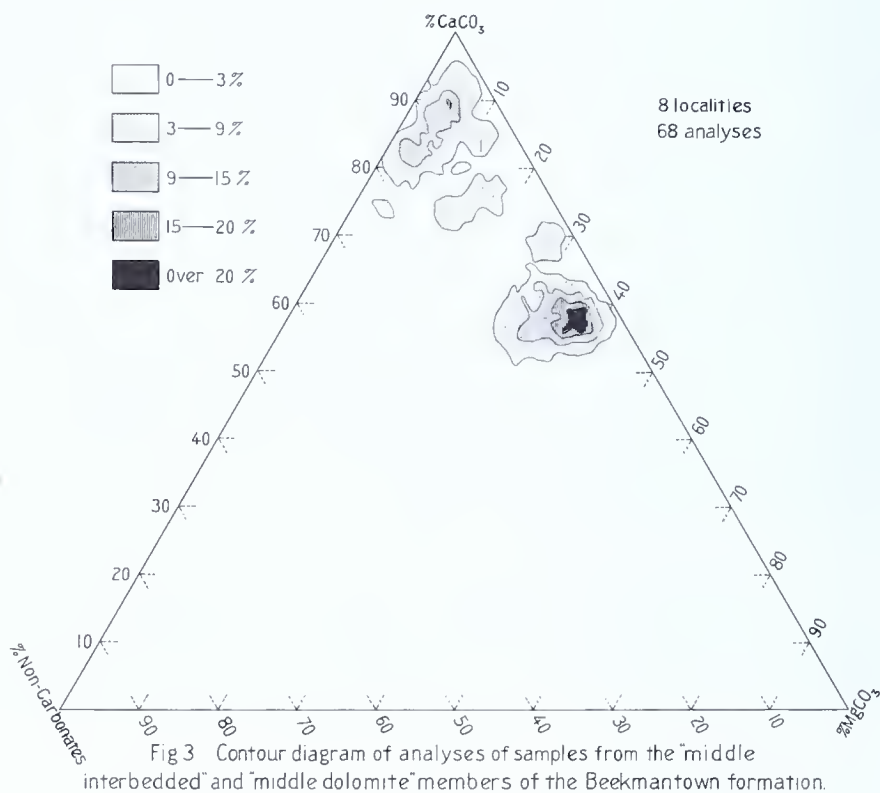
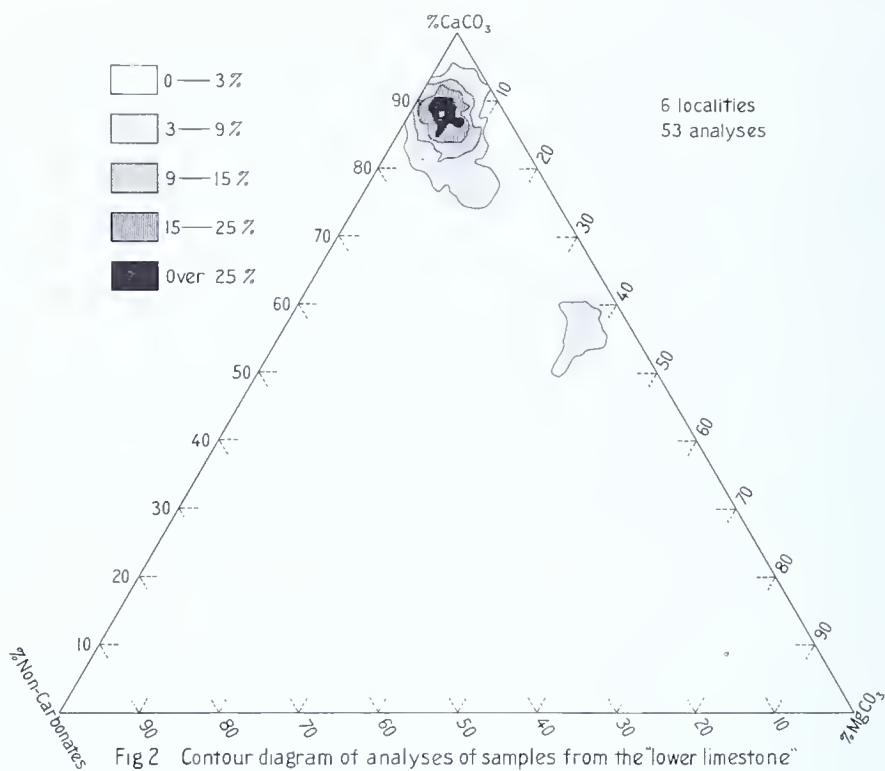
Middle dolomite member. In the quarry at Rickenbach, the interbedded limestones and dolomites are overlain by a rather impure, relatively low-magnesium dolomite. It is believed to grade up into a purer, high-magnesium, massive dolomite which is seen to underlie the upper limestone zone at another locality.

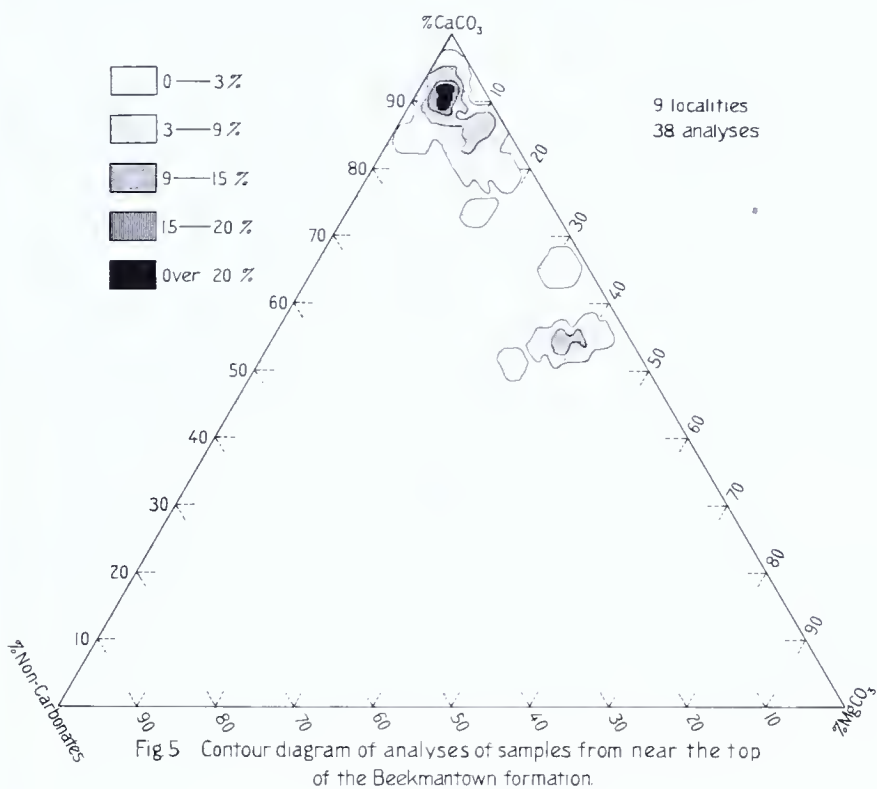
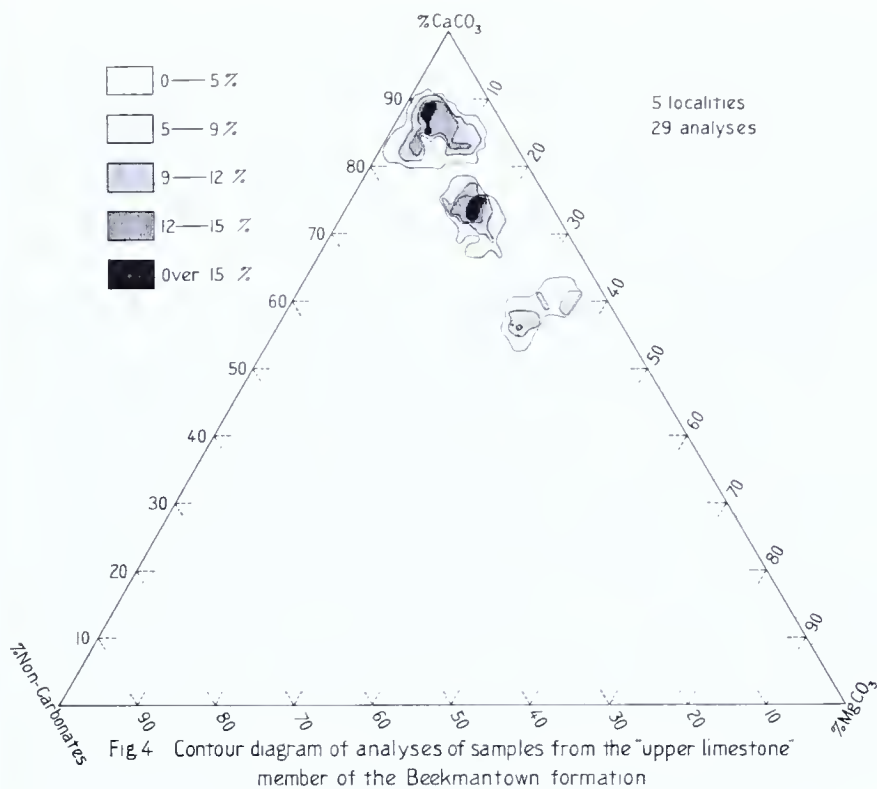
Upper limestone member. Above the massive dolomite, beds of limestone, 8 to 15 feet thick, occur associated with dolomite and thinner limestone beds. The limestones have closely spaced, thin, silty laminations similar to those in all limestones of the formation. Mottling is subordinate or absent, but texture and color are otherwise similar to the rest of the formation. Thin dolomite beds, 6 to 12 inches thick, separate some of the thick limestone beds. The limestone of this member is slightly less pure than that of the lower limestone zone.

Uppermost member. Faulting and a probable erosional unconformity make it very difficult to understand the sequence in the upper portion of the formation. In some places the topmost beds are massive dolomites; elsewhere they are limestone and dolomite interbedded. Somewhere above the upper limestone is a zone containing extensive and large masses of gray and black chert. Above that the average silica content of both the limestones and dolomites is below the average for the formation as a whole.

Chemical Analyses

Four contoured triangular diagrams (figs. 2 - 5) were plotted for the Beekmantown limestone and dolomite. The members, which were defined on the





basis of appearance in the field, show interesting chemical differences as well as an overall similarity. In general, diagrams for all the members show three maxima, indicating that three major chemical types of carbonate rock are represented. The types are pure (or nearly pure) limestone, magnesian limestone, and dolomite.

The lower limestone member (fig. 2) shows a particularly strong high of nearly pure limestone, a minor high of dolomite, and, uniquely, very little magnesian limestone. Figure 3 shows the strongest dolomite high, due to the inclusion of samples from both the middle dolomite and middle interbedded members. Magnesian limestone is indicated but does not form a separate high. The upper limestone member (fig. 4), however, does show three separate maxima, limestone, magnesian limestone, and dolomite. Although the samples from the uppermost portion of the formation show no distinguishing lithologic characteristics, they do show a distinct pattern chemically. The center of the limestone maximum is nearer pure limestone than in any of the other members. Magnesian limestone makes a subordinate high, and the dolomite shows relatively high magnesium and a wide range in insolubles. All three maxima show a definite shift toward the zero per cent of insolubles line. This indicates that the top of the formation should be a favorable zone to prospect for low silica flux stones.

The Beekmantown is almost everywhere suited for crushed stone and ground agricultural limestone (agstone). The lower part of the formation has produced some moderately high-calcium (over 85% CaCO_3) limestone used in cement manufacture. This material, not pure enough to be classified as high-calcium limestone, is referred to as cement limestone in the quarry descriptions. A few beds are low enough in silica to be potential sources of blast furnace flux.

Annvile Limestone

Correlation and Thickness

Overlying the Beekmantown limestone and dolomite in western Berks County is a sequence of limestones which will be described and named Annvile limestone in a forthcoming paper by C. E. Prouty. The name has been used for

years by quarrymen to refer to these beds, which are a source of high-calcium limestone in Lebanon and Dauphin counties. Annville is a town near the center of the quarry district.

The beds were formerly considered to be of Stones River age. Stose (1927, p. 509) cites the finding of a Stones River gastropod (*Maclurea*) near Womelsdorf in support of this correlation. On the basis of lithologic similarity and stratigraphic position, Prouty (personal communication 1950) considers the Annville limestone to be correlative with the "cement limestone" member of the Jacksonburg formation in eastern Pennsylvania. This correlation implies that the age of the Annville limestone is probably in part Trenton and possibly in part Black River.

With the exception of the *Maclurea* reported by Stose, the only fossils found in the formation have been crinoid stems, cystoid stems and plates, and a few unidentified brachiopod fragments. Some beds in the upper part of the formation, however, yield these fragments abundantly, and diagnostic fossils may yet be found.

The Annville limestone in Berks County is composed of two members. The lower member is a thick-bedded, high-calcium limestone, and the upper member is a thin-bedded, impure limestone. At the western boundary of Berks County the total thickness of both members is over 250 feet. The upper member may account for as much as 200 feet of this thickness. The formation thins eastward. At a point three miles east of the county line, the total thickness is about 70 feet. Part of the thinning may be structural, due to attenuation on the overturned limb of a fold. East of Womelsdorf, $4\frac{1}{2}$ miles from the western edge of the county, the limestone is reduced to a thickness of only 20 feet, near the place where it is overridden by a thrust fault. In the Wernersville area, where the beds are once more exposed, faulting makes an estimation of thickness impossible. The formation does not reappear in Berks County east of Wernersville, with the possible exception of some exposures in the Oley Valley.

Lithology

The two members mentioned above are distinct lithologic units, but because of the scarcity of outcrops it is not practical to map them separately. The lower member, the principal source of high-calcium limestone, is a blue to light-gray, crystalline, thick-bedded, pure limestone, which commonly contains abundant veinlets of calcite. One of the most distinctive features of the formation is the finely-fluted weathered surface caused by the "weathering-in" of the laminations. This type of weathering is easily distinguished from the ribbed appearance of the weathered Beekmantown beds whose silty laminae stand out on the surface. The basal beds, in contact with the Beekmantown, have a color mottling on fresh surfaces that is particularly evident when the rock is wet. The surfaces show patches of light pinkish-gray and dark gray that grade into each other so that the patches have indistinct boundaries. This mottling has been helpful in mapping the contact with the Beekmantown. Dolomite and chert are absent or exceedingly rare in the Annville, and their presence can usually be taken as diagnostic of the Beekmantown formation.

The upper member is dark blue-gray, dense, thin-bedded limestone with occasional beds of crystalline limestone (calcarenite). Crinoid and other shell fragments are locally abundant, particularly in the calcarenite beds. Fluting of weathered surfaces is common. In the upper part of the formation are three or four beds, a few inches to more than a foot thick, of greenish-gray, fine-grained, non-calcareous shale that weathers to a yellow-brown sericitic shale, commonly with cubes of limonite pseudomorphs after pyrite. The material is thought to be metabentonite.

Float from the upper member is characterized by thin plates of light-gray limestone that ring when struck with a hammer. When broken, the plates are dark-gray inside and only rarely show any leaching or lightening of color near the edge. Prouty (personal communication) has pointed out that the peculiar columnar quartz found in the soil derived from the upper Annville and Jacksonburg formations is so much more abundant in these formations than in those immediately overlying and underlying that it is a useful guide in mapping.

The diagram of chemical analyses from the Annville limestone (fig.6) shows a much smaller total range of composition than in any of the divisions of the Beekmantown formation. The range is even less if the two members of the Annville are considered individually. All analyses of stone from the lower member contained over 90 per cent CaCO_3 . As clearly indicated by the contours, most of the samples from the upper part of the formation contain between 85 per cent and 90 per cent CaCO_3 . The difference is made up by small increases in both MgCO_3 and the insoluble matter. The upper Annville is chemically intermediate between the lower Annville and the Jacksonburg. Nearly all of the lower member is suitable for blast furnace flux, and some for uses having even more rigid requirements. In general, however, the analyses indicate the Annville from Berks County to be slightly less pure than the stone from the producing quarries of the Annville district. The upper member is, for the most part, sufficiently pure for use as cement limestone but too siliceous for flux stone. It should make excellent agstone.

Jacksonburg Formation

Correlation and Thickness

The name Jacksonburg is applied in this paper to all the impure limestones in part formerly called Leesport lying between the Annville or Beekmantown formation and the Martinsburg formation in Berks County. The name Leesport, as defined by Stose and Jonas (1927, p. 509), is not used, because much of the lithology at the type-section is not similar to that of the beds under discussion. Prouty (personal communication 1950) has found fossils in these beds at Womelsdorf and at Hershey which indicate that they are at least in part correlative with the type Jacksonburg of New Jersey. The name Jacksonburg, therefore, is used until the Leesport is redefined by Prouty in a forthcoming paper.

In western Berks County beds of limestone and dolomite conglomerate occur in the basal portion of the Jacksonburg formation. West of Womelsdorf the portion of the formation containing the conglomerate beds has been mapped as a

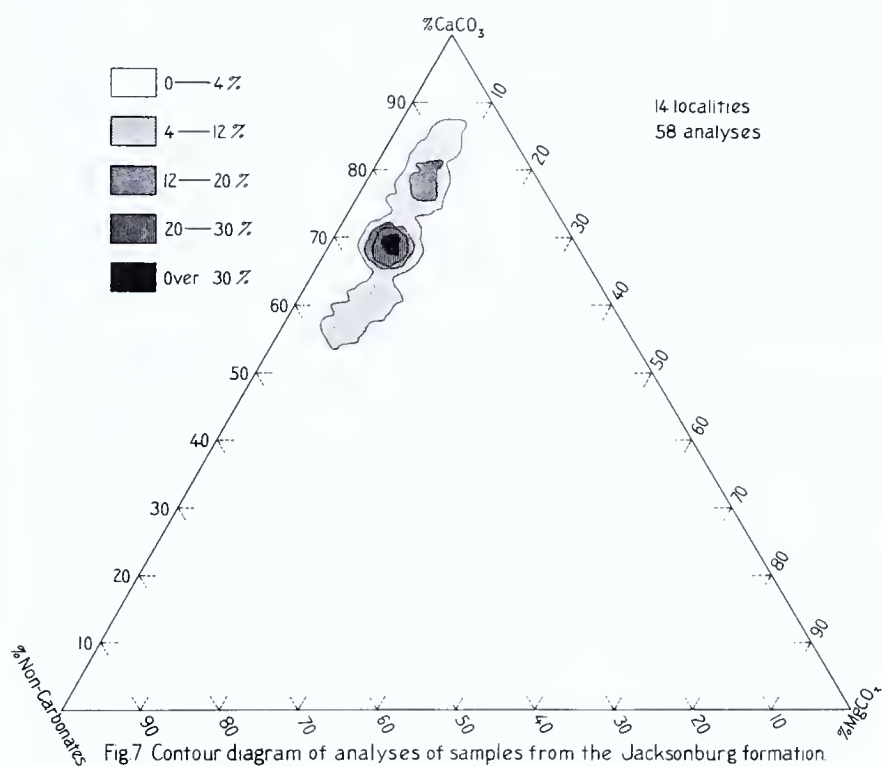
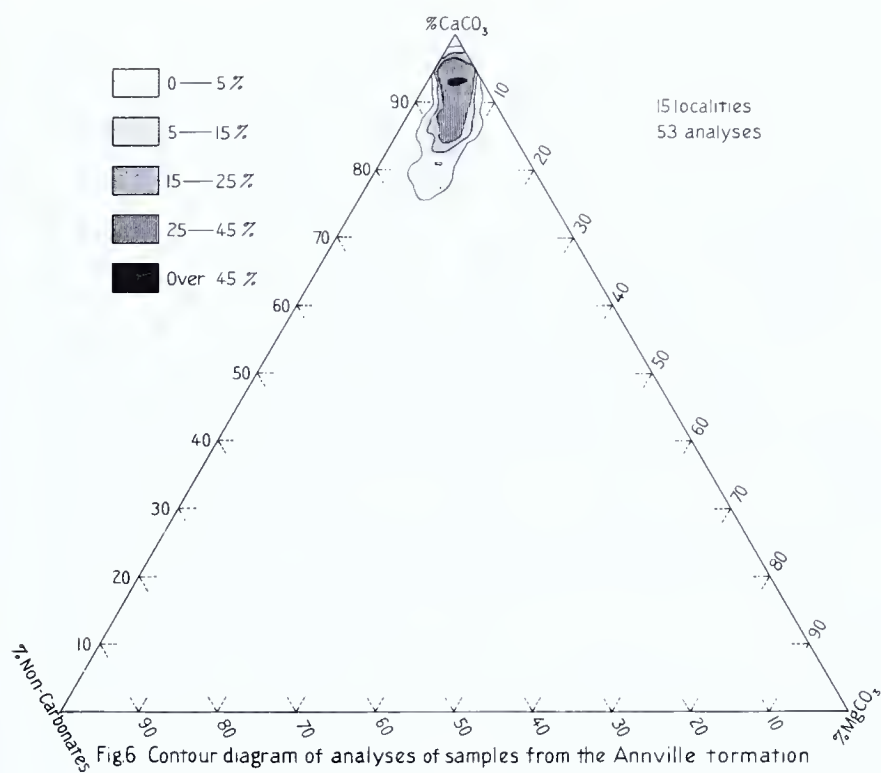
separate member; elsewhere the formation is not subdivided.

The thickness of the formation varies widely in Berks County. It is absent in at least one area due to an erosional unconformity and elsewhere due to thrust-faulting. Intense folding and faulting and the lack of large exposures make it difficult to estimate the thickness of the formation. West of Womelsdorf the basal, conglomeratic portion of the formation is estimated to be about 250 feet thick where fully developed, and the rest of the formation may be as much as 750 feet thick, making the total a maximum of 1000 feet. The whole formation disappears abruptly east of Womelsdorf, being hidden by a thrust-fault. It is, however, present in an anticlinal embayment of the Martinsburg shale northeast of Womelsdorf where the basal conglomerate is absent and the rest of the formation is estimated to be not more than 700 feet thick. Jacksonburg strata, including conglomerate, are present in the Wernersville area, but disappear again east of Wernersville and are not seen for several miles (see pl.1). For at least part of this distance the Martinsburg shale lies directly on the Beekmantown formation with no evidence of faulting. The Jacksonburg reappears just east of the Schuylkill River, and in the river bluffs three miles south of West Leesport, it is known to be more than 271 feet thick. The section measured in the river bluffs ends in the core of a syncline that may be considerably below the top of the formation.

In the eastern part of the county, the belt of outcrop of the formation is interrupted frequently by structural complications, but there is no positive evidence of stratigraphic discontinuity. The Jacksonburg probably averages about 300 feet thick east of the Schuylkill River, although it may be considerably more near the eastern end of the area. At Evansville the thickness has been at least doubled by folding and faulting (Gray 1950).

Lithology

In western Berks County, the Jacksonburg formation is divided into two mappable units. The lower is readily distinguished because it is composed of beds of limestone and dolomite conglomerate, a few inches to tens of feet



thick, separated by shaly limestone interbeds. The conglomerate is composed of angular to sub-rounded pebbles of magnesian limestone and dolomite in a graphitic, shaly limestone matrix. The pebbles are commonly about an inch in diameter, but vary from less than an inch to boulders a foot or more across. Some beds contain only a few scattered pebbles, while in others, especially where the fragments are large, there is scarcely any matrix. In weathered specimens of the finer conglomerates, many of the pebbles are leached to a buff, silty residue, which washes away leaving the conglomerate surface pitted; less commonly the matrix erodes more rapidly so that the pebbles stand in relief on the surface.

In general, the pebbles and boulders of the conglomerate have the texture, color, and general appearance of the dolomitic beds of the Beekmantown formation, believed to be the source of the material. No fossils or other diagnostic features have been found in any of the pebbles. A fossil of Jacksonburg age has been found by Prouty (personal communication 1950) in shaly limestone associated with the conglomerate a mile north of Womelsdorf.

The upper member of the Jacksonburg formation — the whole sequence where the conglomerate member is not developed — consists of gray to black, often graphitic shaly limestone. Locally, particularly in the western part of the county, the lower beds have shaly laminations which appear brown on the weathered surface. Typically, the rock is more homogeneous, and, where well cleaved, bedding is frequently obliterated. Two lithologies are present, but their stratigraphic relation is not known. One is almost black, dense, and slaty, while the other is gray, finely-crystalline, and thin-bedded.

The top of the formation locally grades into limy shale at the base of the Martinsburg, and elsewhere the contact is more abrupt, with quartz-rich sandstones and conglomerates appearing in the basal Martinsburg. This has led the author to believe that there was originally everywhere a gradation from shaly limestone to limy shale. In early Martinsburg time, local uplift and channelling removed part or all of the transition zone and, in one area at least (between Wernersville and the Schuylkill River) removed the entire Jack-

sonburg formation. Additional detailed mapping of the Martinsburg formation is needed to test this hypothesis fully.

Jacksonburg float is easily distinguished from that of the upper Annville beds, as the fragments are platy, with sharp angular edges, and do not ring when struck. Thin pieces of weathered material are frequently bleached to a light-gray all the way through. In general, the material may be distinguished from Martinsburg shale by its effervescence, but, in the western part of the county particularly, certain beds appear to have been leached of all calcium carbonate, leaving a brown, porous shale very similar to some of the weathered Martinsburg shale. The presence of abundant columnar quartz associated with the porous shale can usually be taken to indicate that the Jacksonburg formation was the source of the float. The quartz derived from the Martinsburg formation shows columnar structure much less commonly.

The samples from the Jacksonburg formation fail to indicate any large mass of rock suitable for use in cement manufacture. In general, the magnesia and silica are too high to be acceptable, but this may be due in part to the fact that most of the samples are from partly weathered natural outcrops. Additional testing of some of the purer zones might indicate some usable stone.

SUMMARY OF ECONOMIC POSSIBILITIES

The Beekmantown limestone and dolomite in Berks County is generally suitable for use as crushed stone and agstone. Certain beds have a limited local market as a substitute for high-calcium limestone in cement manufacture. Rock sufficiently low in silica content to be acceptable as blast furnace flux is rare in the Beekmantown of this area.

The lower limestone member of the Beekmantown locally contains stone which is quarried for use as cement limestone. The middle dolomite member at Locality 15 has almost 50 feet of dolomite beds acceptable as blast furnace flux. The limestone beds in the upper limestone member are thinner and even less pure than those of the lower limestone, but may contain limited quantities of cement limestone. The uppermost portion of the formation is probably the

most favorable for prospecting for magnesian flux stone. Analyses of samples from the uppermost member show a generally lower silica content than the average for the remainder of the Beekmantown limestone and dolomite.

The lower member of the Annville limestone is the only unit in Berks County consistently composed of pure limestone. The thickness is variable, but as much as 40 or 50 feet of pure beds probably occur in the Stouchsburg area. In general, the purity is not as high as in the Lebanon-Annville district. Most of the stone could be marketed as blast furnace flux, cement limestone, and agstone, although it is not suitable for chemical lime requiring higher purity.

The upper member of the Annville is an impure limestone. It might have limited use as cement limestone and would make excellent agstone.

The Jacksonburg formation is quarried at Evansville for use in the manufacture of Portland cement. None of the analyses of samples in this investigation indicate any new areas of stone of the composition needed in cement manufacture. In general, all the analyses show that the rock contains either too much magnesia or silica or both. This is particularly true of the samples taken west of the Schuylkill River. The reader should note, however, that almost all of the samples were from partially weathered outcrops. Fresh exposures in this formation are rare. Weathering may have caused a relative enrichment of magnesia and silica content at the expense of the lime.

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A P P E N D I X

Locality descriptions contained in this appendix are arranged according to stratigraphic units discussed above. Since the stratigraphic units each have particular chemical characteristics, the arrangement is a guide to chemical type. For geographic distribution of the localities, the reader is referred to Plate 1.

DESCRIPTION OF LOCALITIES

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Beekmantown limestone and dolomite (Localities 1-42)	24
Lower limestone member (Localities 1-6)	24
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Middle dolomite member (Localities 15 and 16)	40
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LOCALITY 1. Hinterleiter Quarry OWNER Eastern Lime Corporation

LOCATION 1.75 miles NW of Topton
QUADRANGLE Allentown West

Maxatawny TOWNSHIP

LAT. 1.15 mi. N of 40°30'N
LONG. 0.95 mi. E of 75°45'W

TRANSPORTATION 1.8 miles of secondary road to highway U.S.222. Branch line of Reading R.R. passes 100 yds. from the quarry.

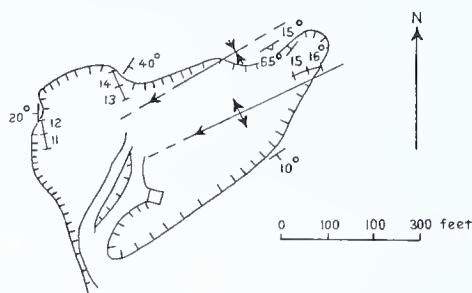
FORMATION Beekmantown

MEMBER Lower limestone

LITHOLOGY The beds quarried for calcium content are massive, blue, fine-grained, laminated limestone, which tends to break into elongate fragments and therefore is called "longsplit" by the quarrymen. Overlying this type is a blue and brownish mottled, finely-crystalline magnesian limestone. Occasional thin beds of gray dolomite veined with calcite occur in both types.

STRUCTURE The quarry is on the crest of an anticline whose axis strikes N55°E and plunges gently SW. A parallel, but apparently smaller scale syncline on the NW flank of the anticline is imperfectly exposed. The SW extension of these folds is cut off by a fault of unknown strike.

SAMPLE LOCATION AND SEQUENCE The samples were taken in pairs at the W end, center, and S end of the face. No. 12 overlies No. 11, No. 14 overlies No. 13, No. 16 overlies No. 15.



FACE HEIGHT 50 to 60 feet.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
12	0.98		5.64	87.64	5.39	25'	Mottled and some laminated blue ls.
11	0.92		4.76	84.32	9.67	9'10"	Mottled ls.
14	1.34		7.52	86.94	2.69	20'	Mottled ls., E of fault.
13	1.14		4.74	91.88	2.09	10'	Massive blue ls.
16						25'	
15	1.84		10.12	82.18	5.10	25'	Dark, sparsely laminated ls.

OPERATING PROBLEMS No water is present in the quarry. Overburden is very irregular in thickness and must be removed by hand from some deep seams.

RESERVES Drilling has indicated good stone on the N flank of the anticline, below the present quarry floor. NW of the present working face the limestone changes abruptly to dolomite.

CLASSIFICATION Active. Stone is acceptable to near-by cement plants as cement limestone. Agstone and crushed stone are also produced.

LOCALITY 2. Kirbyville Quarry OWNER Allentown Portland Cement Company

LOCATION Kirbyville
QUADRANGLE Reading

Richmond TOWNSHIP

LAT. 1.95 mi. S of 40°30'N
LONG. 1.33 mi. W of 75°50'W

TRANSPORTATION 500 feet from highway U. S. 222.

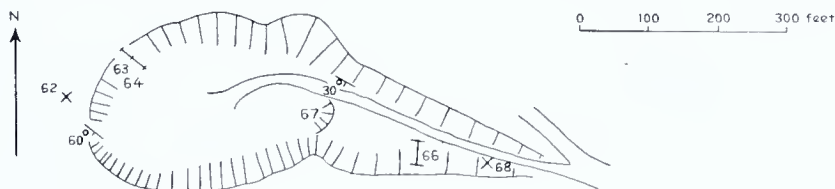
FORMATION Beekmantown

MEMBER Lower limestone

LITHOLOGY Three types were observed. The most common is massive, blue, fine-grained limestone with laminations usually visible on weathered surfaces only. Associated are masses and possibly beds of coarsely-crystalline brownish-blue limestone. One thick bed of blue to pinkish-gray dolomite occurs.

STRUCTURE Bedding in the limestone is obscure. Contact with dolomite bed strikes N55°W and dips 35° to 60°NW. Faint cleavage strikes N80°W, and dips 60°S. At E end of quarry beds strike N80°W and dip 25°S. Possibly quarry is on S limb of an anticline plunging W. Lack of continuity of limestone outside quarry is due to plunge of the fold on the W and a probable fault on the E. Joints observed strike and dip, respectively: N70°E, 85°N; N20°E, 80°W; N-S, 80°W.

SAMPLE LOCATION AND SEQUENCE All samples and observations from the smaller more recently worked quarry. No. 62 from pinnacle in stripping at W and No. 63 and No. 64 from face at W end, No. 63 is younger. No. 65 from mass of crystalline limestone within No. 63. No. 66 and No. 68 are from exposures at E end. No. 67 is a sample of broken rock at E face.



FACE HEIGHT 75 feet.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
62	2.30		7.20	59.95	30.40	—	Crystalline dl. from pinnacle.
63	0.64		6.36	90.73	2.27	12'	Dense, blue laminated ls.
64	0.92		4.50	89.16	4.78	14'	Dense, blue laminated ls.
65	0.68		2.34	91.82	5.16	—	Mass of crystalline ls. not included in No. 63.
66	1.68		6.76	76.19	15.75	19'	Granular, light-gray ls., very hard.
67	0.88		7.22	87.20	4.00	—	Broken rock at E face.
68	1.34		4.60	90.93	2.88	8'?	Light-gray ls. with contorted laminae.

OPERATING PROBLEMS Heavy inflow of water made continuous pumping necessary when quarry was operated. Overburden averages 8' and uneven rock surface made removal very difficult. Calcium content of product was seriously affected by addition of clay. Analyses of clean rock show acceptable stone.

RESERVES Extension of acceptable limestone beyond the limits of the quarries has not been found.

CLASSIFICATION Quarry abandoned August 1949. Formerly produced cement limestone.

LOCALITY 3. Smith Quarry.

OWNER Under lease to Eastern Lime Corp.

LOCATION 1.75 miles NW of Topton

Maxatawny TOWNSHIP

QUADRANGLE Allentown West

LAT. 1.55 mi. N of 40°30'N

LONG. 1.13 mi. E of 75°45'W

TRANSPORTATION 0.2 mi. to nearest improved road. From there 0.5 mi. to railroad, or 1.0 mi. to highway U.S.222.

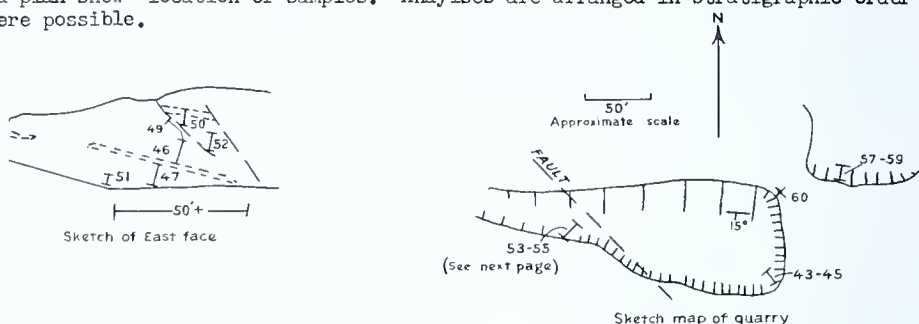
FORMATION Beekmantown

MEMBER Lower limestone

LITHOLOGY Thick limestone beds with occasional thin dolomite layers. Limestone is blue, dense, with brown silty laminae on weathered surface, locally grading into blue and brownish-gray fucoidal mottling. Dolomite is gray, finely-crystalline in beds 6 to 12" thick. Calcite-filled gash veins are common in the dolomite.

STRUCTURE A cross fault near center of S face separates rocks of the above lithology from interbedded limestone and dolomite. The fault strikes N60°W and is vertical. Bedding on both sides of the fault strikes N80°W and dips 15°S. In the E face a few reverse faults of small displacement are exposed. Some boudinage of the dolomite beds was noted. Chert common near fault.

SAMPLE LOCATION AND SEQUENCE Sequence confused by the faulting. Sketch of face and plan show location of samples. Analyses are arranged in stratigraphic order where possible.



FACE HEIGHT 50 feet.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
45	0.68		6.88	84.99	7.14	10'	Gray laminated ls.
44	0.84		6.88	84.46	7.69	9'	Laminated and mottled ls.
43	1.44		12.70	79.16	6.84	10'	Blue laminated ls.
50	0.82		6.14	84.50	8.61	7'	Mottled and faintly laminated ls.
52	0.74		5.96	84.50	8.51	9'6"	Laminated and mottled ls.
49	1.28		6.76	77.28	13.68	6'	Mottled ls.
46	0.74		9.46	86.44	2.71	11'6"	Laminated and mottled ls.
47	0.50		4.92	89.41	4.92	7'	Laminated blue ls.
60	1.28		6.02	90.37	1.56	4'	Gray crystalline ls.
51	0.60		7.34	89.66	2.30	5'6"	Down-dip equivalent of No.60
59	1.96		9.88	84.68	3.16	4'	Platy weathering ls.
58	0.90		8.26	88.07	2.36	8'	Blue laminated ls.
57	0.64		5.28	88.77	4.86	11'	Mottled ls.

OPERATING PROBLEMS Overburden is thin except at fault. Chief problem is to unravel structure to find continuation of the limestone zones.

RESERVES Large reserves of limestone believed to exist S of present face. Purer limestone occurs on the N and below floor of the quarry. Sample No. 61 indicates extension of these beds to the E. (See next page.)

CLASSIFICATION Not operating, formerly produced agricultural lime. Some of the rock would be acceptable as cement limestone at near-by plants.

LOCALITY 3. Smith Quarry

OWNER

LOCATION

QUADRANGLE

LAT.

LONG.

TOWNSHIP

TRANSPORTATION

FORMATION

LITHOLOGY

MEMBER

STRUCTURE

SAMPLE LOCATION AND SEQUENCE Samples No's. 53 - 56 are from main quarry, W of the fault. No. 48 is from an outcrop in the field N of the quarry. No. 61 is from a smaller opening E of the main quarry.

FACE HEIGHT

ANALYSES OF SAMPLES							Remarks
No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
56	0.34	0.22	7.34	87.14	4.85	7'	Blue ls., solution pits on surface.
55	0.96		7.60	77.92	13.47	6'	Blue ls., irregular bedding.
54	0.42		6.22	87.11	5.90	5'6"	Fucoidal limestone.
53	1.48		20.44	63.79	14.09	6'	Cherty dolomite.
48	1.28		11.20	83.23	4.24	4'	Blue limestone.
61	1.02		8.00	87.35	2.91	15'	Blue laminated limestone.

OPERATING PROBLEMS

RESERVES

CLASSIFICATION

LOCALITY 4. Bailey Quarry

OWNER

LOCATION 1.8 mi. NW of Topton
QUADRANGLE Allentown West

Maxatawny TOWNSHIP

LAT. 1.85 mi. N of 40°30'N

LONG. 1.47 mi. E of 75°45' W

TRANSPORTATION 0.1 mile from paved road leading to highway U.S.222 and to railroad at Topton.

FORMATION Beekmantown

MEMBER Lower limestone (?)

LITHOLOGY Interbedded limestone and dolomite. The limestone is gray with thick black siliceous laminae or bands which stand out strongly in weathered surface. The laminae are particularly thick in a few of the beds. The dolomite beds are gray, finely crystalline with only faint lamination.

STRUCTURE The beds strike N65°E to N75°E and dip 18° to 25°SE. Axial planes of drag folds in the laminations strike N60°E and dip 75°SE.

SAMPLE LOCATION AND SEQUENCE Samples all collected from SW end of the quarry except for No. 21 which is from near the center of the N side of the quarry. No. 20 - No. 17 are in direct, descending sequence. No. 21 is older than No. 17, with an unknown thickness intervening.

FACE HEIGHT 40 feet.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
20	1.33	3.89	17.36	66.54	5.61	12'	Strongly laminated ls.
19	2.22		8.78	67.60	20.36	7'6"	Dl. with faint laminations.
18	2.10		14.52	72.94	10.24	14'	Blue-gray laminated ls.
17	1.66		9.16	78.99	9.86	15-20'	Incompletely exposed due to talus.
21	0.88		6.58	90.02	1.81	5'	Ls. from N side of quarry.

OPERATING PROBLEMS Overburden is thick on N side but may be less to the SW. There is no water in quarry.

RESERVES A large quantity of similar stone is probably available in hill to the SW.

CLASSIFICATION Inactive, formerly operated for crushed stone and possibly agricultural lime. Rock unusually high in SiO₂ for this horizon.

LOCALITY 5. Outcrops

OWNER H. R. Mertz

LOCATION 2.5 mi. NW. of Fleetwood

Richmond TOWNSHIP

QUADRANGLE Reading

LAT. 1.55 mi. S of 40°30'N.

LONG. 0.85 mi. W of 75°50'W.

TRANSPORTATION 0.2 mi. improved road to highway U.S.222.

FORMATION Beekmantown

MEMBER Lower limestone.

LITHOLOGY Blue laminated limestone with massive dolomite interbeds.

STRUCTURE The beds strike between N85°E and N70°E, and dip 30° to 45°S except for one outcrop where the strike is N15°E and the dip 60°NE. The outcrops are scattered and overall structure is not clear.

SAMPLE LOCATION AND SEQUENCE Samples from scattered outcrops in picnic grove on the H. R. Mertz farm. No. 209 appears to be from crest of a fold, and may be oldest rock in the group. No. 211 is seen to overlie No. 210.

FACE HEIGHT

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
213	0.38	1.88	4.88	85.71	6.02	20'	50 yds. N of No. 212.
212	0.56	1.97	3.04	85.95	5.42	10'	Laminated blue ls.
211	0.73	1.82	4.57	82.19	9.98	4'	Overlies No. 210.
210	0.56	2.64	5.83	80.62	9.30	3'±	Probably younger than No. 209.
209	0.66	2.27	5.15	77.74	13.21	4'	From N plunging fold.

OPERATING PROBLEMS Number of outcrops suggests thin overburden, but does not rule out possibility of deep clay seams.

RESERVES Not known.

CLASSIFICATION This stone has not been quarried here. Analyses indicate it would make an excellent quality agstone and possibly some cement limestone could be produced.

LOCALITY 6. Koller Quarry

OWNER Edward Tyson

LOCATION 1 mi. SE of Kutztown

Maxatawny TOWNSHIP

QUADRANGLE Hamburg

LAT. 0.08 mi. N of 40°30'N

LONG. 1.05 mi. W of 75°45'W

TRANSPORTATION

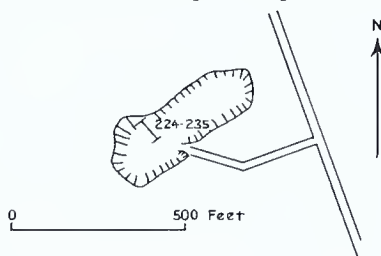
FORMATION Beekmantown

MEMBER Lower limestone (?)

LITHOLOGY Dolomite with some interbedded limestone. This is believed to be the transition between the lower limestone and middle interbedded members. Dolomite is gray, even-bedded, finely crystalline, and grades into mottled magnesian limestone in some beds. Limestone beds are 1 - 3' thick, vary from blue laminated to gray with faint mottling.

STRUCTURE Beds in the quarry are essentially horizontal. On the south side the strike is about N90°E with gentle N dip.

SAMPLE LOCATION AND SEQUENCE Samples were taken from exposures in the quarry floor and near the W end of the N face. No. 224 is from the oldest bed exposed. The remaining samples follow the sequence up with only minor breaks.



FACE HEIGHT 35 feet ±

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
235	0.14	0.50	3.65	88.60	7.38	3'	Laminated ls.
234	0.56	0.91	3.32	59.91	35.75	—	
233	0.97	1.16	7.39	50.30	39.76	4'	Dolomite.
232	0.91	2.65	8.82	52.16	35.03	10'6"	Laminated ls.
231	0.70	2.54	12.15	62.64	20.37	2'6"	Mottled dolomitic ls. contains pyrite.
230	0.83	1.02	5.11	55.38	38.37	3'	Massive dolomite.
229	0.07	0.35	1.57	96.53	2.26	2'	Blue limestone.
228	0.70	1.00	4.39	56.50	38.60	2'8"	Massive dolomite.
227	0.14	0.48	3.21	92.16	4.34	1'8"	Gray limestone.
226	0.56	0.87	5.17	57.01	36.51	1'6"	Dolomite
225	0.14	0.54	2.14	91.78	5.89	3'	Gray ls., mottled near top.
224	0.31	0.72	3.22	75.40	20.59	2'	Dolomite

OPERATING PROBLEMS Average thickness of overburden is 5' but wide clay seams reach all the way to the quarry floor. No water in quarry floor during dry season.

RESERVES Quarry could be enlarged considerably toward the N and W in the same beds, except for limitations imposed by thick overburden.

CLASSIFICATION Inactive, formerly operated for crushed stone and building stone. Would make good magnesian agstone.

LOCALITY 7. Rickenbach Sta. Quarry OWNER William Brossman

LOCATION Rickenbach Station

Bern TOWNSHIP

QUADRANGLE Reading

LAT. 0.50 mi. N of 40°25'N

LONG. 2.24 mi. W of 75°55'W

TRANSPORTATION Adjacent to railroad.

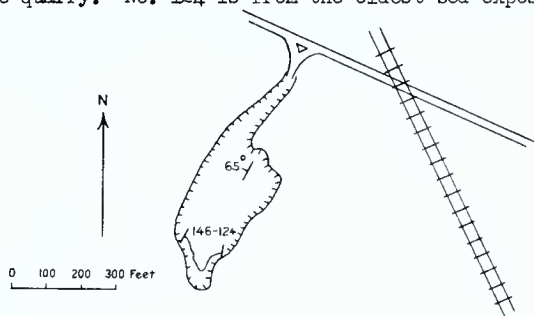
FORMATION Beekmantown

MEMBER Middle interbedded.

LITHOLOGY Alternating limestone and dolomite grading upward into thick-bedded dolomite. Limestones are blue, laminated or mottled. Laminations are black on fresh surfaces and weather brown. Mottled beds contain a few gastropod fossils. Dolomites are gray, crystalline with a few beds showing faint laminations. One large bedding surface exposure has polygonal mud crack markings.

STRUCTURE Strike averages N25°E through length of the quarry. Dip is 65°NW with local steepening but nowhere vertical or overturned.

SAMPLE LOCATION AND SEQUENCE Samples were taken in regular order across the SW end of the quarry. No. 124 is from the oldest bed exposed in the quarry.



FACE HEIGHT 50 feet.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
146	1.28	1.34	11.46	55.65	29.90	12'	Massive gray dolomite.
145	0.64	0.52	6.40	60.13	30.99	19'	Massive gray dl. in beds 2-3' thick.
144	1.14		6.24	57.45	33.57	13'	Massive gray dl.
143	0.49	0.81	6.12	76.78	15.66	15'	Dolomite and 3' of light-gray ls.
142	0.41	0.01	1.68	93.32	4.22	2'6"	Light-gray limestone. #141 and #142.
141	0.64	0.18	5.26	87.35	6.21	8'	Massive blue dl. 15' covered between /
140	0.83	0.93	7.14	60.13	30.28	9'	Blue ls., few laminae, laminated ls.
139	0.90	0.38	7.52	74.18	16.73	10'	4' laminated ls, 3' mottled ls, 3' /
138		0.86	10.10	82.80	4.84	5'?	Laminated blue limestone.
137		1.52	9.08	57.80	30.28	5'	Dolomite and some limestone.
136	0.71	0.71	13.84	81.01	3.16	6'6"	Blue limestone, strongly laminated.
135		0.88	12.08	57.48	28.35	7'	Dolomite.
134		1.46	10.40	84.15	3.48	15'	Gray ls. and some calcarenite.
133	1.31	0.71	9.68	55.74	30.99	2'7"	Massive dolomite.

OPERATING PROBLEMS Overburden averages 5 to 8 feet with local deep clay seams. About 10 feet of water in the deepest part of the quarry. Water is fresh and clear, suggesting circulation.

RESERVES Beds sampled have been quarried up to 400 feet along strike. Continuation to SW for an equal distance is possible.

CLASSIFICATION Inactive, now being used as a dump. Formerly operated for crushed stone and agricultural lime.

LOCALITY 7. Rickenbach Sta. Quarry OWNER William Brossman

LOCATION
QUADRANGLE

LAT.
LONG.

TOWNSHIP

TRANSPORTATION

FORMATION
LITHOLOGY

MEMBER

STRUCTURE

SAMPLE LOCATION AND SEQUENCE

FACE HEIGHT

ANALYSES OF SAMPLES							Remarks
No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
132	0.53	0.43	6.21	88.59	4.31	7'	Blue ls., well laminated.
131	1.41	3.15	12.76	52.53	29.53	8'	Three beds of gray dolomite.
130	1.00		6.48	87.36	5.21	8'6"	Blue laminated ls, with a few fucoids.
129	0.71	0.65	13.26	77.66	8.30	10'	Magnesian ls and dl.
128	2.18		10.46	54.44	32.46	3'6"	Massive dolomite.
127	0.40	2.50	14.78	73.45	8.87	7'6"	Blue laminated ls, scattered calcite grains.
126	0.41	0.41	6.44	88.59	4.58	2'8"	Massive dl, with calcite veins.
125	1.62		19.42	75.43	3.66	9'	Blue laminated ls, some mottling.
124	1.38		14.86	79.70	3.51	3'	Blue laminated ls.

OPERATING PROBLEMS

RESERVES

CLASSIFICATION

LOCALITY 8. Quarry and Outcrops OWNER

LOCATION 0.7 mi. W of Kirbyville Maiden Creek TOWNSHIP
QUADRANGLE Reading LAT. 2.10 mi. S. of 40°30'N

LONG. 2.05 mi. W of 75°50'W

TRANSPORTATION 0.3 mi. of hard surface road from the quarry to highway U.S.222.

FORMATION Beekmantown MEMBER Middle interbedded (?)

LITHOLOGY Outcrops consist of pinkish-gray, thin-bedded calcarenite. The underlying rocks exposed in the quarry are chiefly blue, laminated limestone with one thin dolomite bed. Cleavage is faintly indicated. Chert occurs in float near the quarry but none was seen in place.

STRUCTURE The outcrops W of the quarry strike N-S to N10°W, and dip 25°W. In the quarry the strike is N25°E and the dip is 25°NW. Cleavage strikes N70°W to N65°W and dips 20° to 23°SW.

SAMPLE LOCATION AND SEQUENCE The outcrops included in sample No. 94 are near the crest of a rise about 400' W of the quarry. These beds are younger than those in the quarry. In the quarry, which is very small, No. 95 is from the oldest bed exposed, No. 96 and No. 97 overlies directly and in order.

FACE HEIGHT 8 feet.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
94	1.12		9.46	87.11	2.27	20'	Calcarenite outcrops in field.
97	0.64	0.22	7.48	77.62	13.72	5'	Dl. & ls, thins due to flowage.
96	1.30		10.32	84.86	5.35	10'	Laminated limestone.
95	0.53	1.09	9.96	83.26	5.35	8'	Like No. 96.

OPERATING PROBLEMS Overburden is irregular, but about 5' thick. No water here, but an old iron pit near-by is filled with water.

RESERVES Not known.

CLASSIFICATION Inactive, probably opened for agricultural lime. Would make a good agstone.

LOCALITY 9. Quarry

OWNER City of Reading

LOCATION 1.8 mi. NW of Blandon
QUADRANGLE

Maiden Creek TOWNSHIP

LAT. 2.82 mi. S of 40°30'N.

LONG. 0.55 mi. E of 75°55'W.

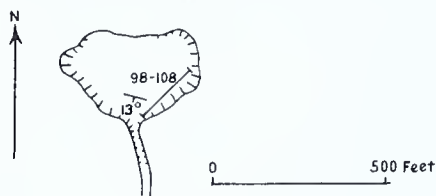
TRANSPORTATION Rails have been removed from former 1000-foot rail spur into the quarry, 0.15 mi. to nearest hard surface road, 1 mile from there to highway US 222.
FORMATION Beekmantown.

MEMBER Middle interbedded.

LITHOLOGY Limestone in 5 - 8' beds separated by dolomite in 1 - 6' beds. Limestone, blue massive light-gray weathering, to blue laminated or fucoidal, weathering dark-gray. Dolomite is gray and massive. Bed in floor of quarry composed of angular dolomite fragments cemented with calcite and quartz. Locally pyrite replaces dolomite in the breccia.

STRUCTURE Strike and dip very regular throughout the quarry. Beds strike N77°W and dip 13°S.

SAMPLE LOCATION AND SEQUENCE Samples were taken from the SE face of the quarry. No. 98 is from the oldest bed, succeeding samples are in stratigraphic order with no break.



FACE HEIGHT 35 feet at highest point.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
108	0.83	0.77	21.72	72.41	3.79	7'	Laminated ls, somewhat weathered.
107	0.83	0.25	7.52	56.93	35.00	3'6"	Massive dl.
106	0.56	0.42	8.10	83.97	6.18	9'	Finely laminated ls.
105	0.94	0.66	8.76	55.21	34.83	3'	Two dl. beds separated by 4" of dark ls.
104	0.68	0.54	13.16	72.23	12.72	5'	Fossiliferous banded ls.
103	0.64	0.16	3.70	60.68	34.72	2'6"	Dolomite.
102		0.62	5.92	83.90	9.40	6'	Fucoidal ls. with indistinct banding.
101		1.06	4.92	58.19	35.73	7'	Massive dl.
100		1.40	11.00	73.12	13.85	4'	Light-gray weathering ls.
99	0.49	0.37	5.10	65.82	28.78	4'6"	Massive dl. faintly laminated.
98		1.00	7.00	61.20	30.81	5'	Dl. and dl. breccia.

OPERATING PROBLEMS Overburden is thin and has been partially removed S of the face. No water in this quarry, but two pits W of the R.R. are water filled. Land is now included in watershed for City of Reading reservoir and not available for quarry operations.

RESERVES The quarry could be about doubled in size in these same beds.

CLASSIFICATION Inactive, formerly selectively quarried for cement limestone and crushed stone. Stone is not fit for present use as cement limestone. Agstone and crushed stone could be produced.

LOCALITY 10.

OWNER City of Reading

LOCATION 1.6 mi. NW of Blandon
QUADRANGLE Reading

Maiden Creek TOWNSHIP
LAT. 2.90 mi. S of 40°30'N
LONG. 0.70 mi. E of 75°55'W

TRANSPORTATION Adjacent to railroad, one mile of hard surface road from quarry to highway U.S.222.

FORMATION Beekmantown

MEMBER Middle interbedded.

LITHOLOGY Light-gray, fine-crystalline, laminated limestone with thin dolomite limestone interbeds.

STRUCTURE The beds strike about N90°E and dip 20°S.

SAMPLE LOCATION AND SEQUENCE Samples were taken from exposures on E side of the quarry. No. 109 is the older and is separated from No. 111 by about 25' of beds.

FACE HEIGHT

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
111	0.68	0.62	14.94	82.20	1.47	10'	Ls. with thick silty laminae.
109	0.75	0.81	14.28	81.67	2.31	14'	Light-gray crystalline ls.

OPERATING PROBLEMS Overburden generally thin. No water here, but near-by pit is full.

RESERVES Small, due to location of railroad on one side of the quarry and road on the other.

CLASSIFICATION Inactive, formerly operated for crushed stone and possibly cement limestone.

LOCALITY 11. Quarry

OWNER Harry Althouse

LOCATION 1 mi. S of West Leesport

Bern TOWNSHIP

QUADRANGLE Reading

LAT. 1.03 mi. N of 40°25'N

LONG. 2.45 mi. W of 75°55'W

TRANSPORTATION Rails have been removed from spur to Reading RR line. Nearest paved road is 0.35 mi. from the quarry.

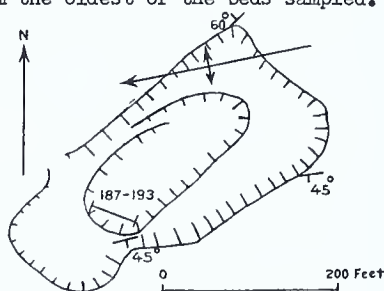
FORMATION Beekmantown

MEMBER Middle interbedded.

LITHOLOGY Dolomite, alternating with limestone or magnesian limestone. The dolomite is gray, massive with occasional faint lamination. The limestone is blue with faint lamination and fucoidal mottling.

STRUCTURE In most of the quarry the beds strike N80°E with an average dip of 45°S. An anticlinal axis passes through the northern corner of the quarry and on the N limb of this fold the beds strike N45°E and dip 60°NW. The axis plunges gently SW. Boudinage occurs in the thinner dolomite beds.

SAMPLE LOCATION AND SEQUENCE Samples taken in the inner, lower level of the quarry. No. 187 is from the oldest of the beds sampled.



FACE HEIGHT 35 feet total. Quarry was worked in two benches.

ANALYSES OF SAMPLES							Remarks
No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
193	0.38	1.42	2.80	72.67	22.73	15'	Dl. with thin ls. interbeds.
192	0.86		4.06	76.01	18.68	8'	Dolomite.
191	0.52		2.82	89.84	6.39	2'6"	Faintly laminated ls.
190	2.12		6.20	58.88	33.24	3'6"	Massive dl. and laminated ls.
189	0.48		1.42	93.75	4.24	6'	Gray ls., in part mottled.
188	1.68		3.68	60.13	35.04	10'6"	Dl., in part banded. of ls.
187	1.18		3.06	60.85	34.88	10'	Massive, gray dl. includes thin beds /

OPERATING PROBLEMS Thickness of the overburden is very irregular, pinnacles being well developed. Clay seams are as much as 20' deep. There was no water in the quarry in the summer of 1949.

RESERVES There appears to be ample room for enlargement of the quarry.

CLASSIFICATION Inactive, formerly produced agricultural lime. The samples average 3.3% SiO₂ which is just too high for flux stone by present standards. Rock is suitable for agstone and crushed stone.

LOCALITY 12. Quarry

OWNER Ontelaunee Orchards

LOCATION 0.75 mi. SW of Leesport

Ontelaunee TOWNSHIP

QUADRANGLE Reading

LAT. 1.65 mi. N of 40°25'N

LONG. 2.00 mi. W of 75°55'W

TRANSPORTATION 0.2 miles from center of quarry to highway U. S. 122.

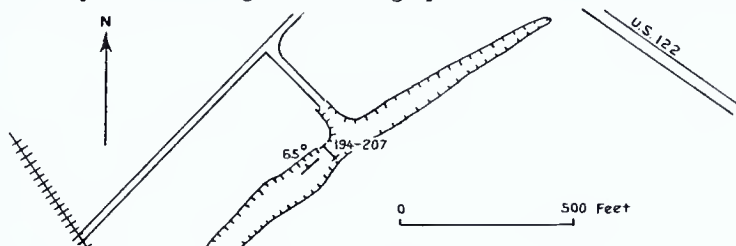
FORMATION Beekmantown

MEMBER Middle interbedded.

LITHOLOGY Interbedded limestone and dolomite both showing a variety of lithology. Limestone is blue, dense with black laminations to gray, crystalline, with only faint lamination. Some beds show distinct fucoidal mottling. The limestone may grade into dolomite, with strong mottling in the transition zone. Dolomite is chiefly gray, finely crystalline and massive. One bed shows indistinct conglomeratic texture.

STRUCTURE The quarry follows the strike of the beds for 0.32 miles. The average strike is N45°E and the dip is about 65°NE. Near the center of the quarry, a synclinal drag fold occurs in the S. wall. Its axis strikes N75°E and plunges gently SW. This fold is overturned.

SAMPLE LOCATION AND SEQUENCE The samples were taken across the floor near the center of the quarry. Not all the beds which have been quarried could be reached. No. 194 is from the oldest bed sampled. Structure is confused in the lower part of the section and minor repetitions are possible. Above No. 198 the sequence is regular. The analyses are arranged in stratigraphic order.



FACE HEIGHT 50 feet ±

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
207	1.40		3.86	84.35	10.91	15'	Laminated, gray, crystalline ls.
206	1.08		4.52	61.85	32.61	4'6"	Massive dl., grades up into ls.
205	0.48		2.22	84.29	12.55	4'	Alternating dl. and ls. bands.
204	0.52		2.02	91.18	5.91	7'	Gray crystalline ls., faint lamination.
203	0.82		5.28	58.67	35.10	7'	Dl. with conglomerate texture.
202	1.00		10.10	83.26	5.13	5'	Laminated ls., dl. bands near base.
201	1.04		7.50	69.68	22.16	3'6"	Mottled dolomitic ls.
200	1.02		2.10	69.91	26.34	4'6"	Massive dl., grading up into mottled ls.
199	1.40		10.92	83.26	3.83	20'	Gray ls., with irregular lamination.
198	1.92		11.44	58.86	27.66	10'	Dl. and faintly mottled dolomitic ls.
197	1.16		12.40	82.62	2.89	18'	Blue gray ls. with black laminae.
196	0.83	0.61	8.98	54.94	33.95	5'	Massive dl.
195	0.96		8.38	77.83	12.37	8'	3' of ls., 5' of dl.
194	1.86		11.08	53.17	33.83	12'	Massive blue-gray dolomite.

OPERATING PROBLEMS Overburden moderate to heavy. Water covers floor of entire quarry except at the center.

RESERVES Beds sampled have been quarried all the way from the highway to the railroad. Extension E of the highway is probable. Water probably limits the extent to which reserves exist below the present quarry.

CLASSIFICATION Inactive, formerly produced agricultural lime. Suitable for agstone and crushed stone. Only 10' of beds are of flux-grade.

LOCALITY 13a and 13b Quarries OWNER

LOCATION 0.7 mi. NW of Kirbyville Richmond TOWNSHIP
QUADRANGLE Reading LAT. 1.40 mi. S of 40°30'N

LONG. 1.93 mi. W of 75°50'W

TRANSPORTATION 0.7 mi. of paved road from quarry to highway U.S. 222.

FORMATION Beekmantown MEMBER Middle interbedded.

LITHOLOGY Interbedded limestone and dolomite. Dolomite is gray, massive or faintly laminated. A transition zone of mottled dolomitic limestone occurs between some limestone and dolomite beds. Limestone beds are blue, laminated, the laminations weather out as brown silty ridges.

STRUCTURE The average strike of the beds is N20°W and the dip is 10°SW. The beds in the floor of the quarry are warped by small, gentle, open folds whose axes trend N75°E to N85°E; that is, about perpendicular to the average strike.

SAMPLE LOCATION AND SEQUENCE Samples No's. 214 - 221 taken from beds exposed in the center and northern part of quarry 13a. No. 214 is from the oldest bed sampled. Samples No's. 222 and 223 are from locality No. 13b, a small quarry 650 feet N60 E of No. 13a. Sample No. 223 is from beds directly overlying those included in sample No. 222.

FACE HEIGHT 5 to 20 feet at locality 13a.

ANALYSES OF SAMPLES							
No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
221	0.52	0.82	5.17	90.12	2.79	2'	Weathered limestone.
220	0.70	1.39	3.73	55.50	38.34	1'	Gray dolomite.
219	0.42	1.78	6.52	86.95	3.11	4'6"	Laminated limestone.
218	0.63	2.07	7.41	60.42	28.90	1'2"	Gray dolomite.
217	0.07	0.94	3.00	94.11	1.53	5'	Blue limestone with thin laminations.
216	0.59	2.11	6.69	63.47	26.88	2'6"	Faintly laminated dl. and mottled ls.
215	0.35	1.66	5.18	88.99	2.77	5'	Blue laminated limestone.
214	0.97	1.61	4.95	56.25	36.04	2'	Massive dolomite.
223	0.38	0.77	5.40	88.23	3.89	9'	Faintly laminated ls.
222	0.45	0.98	7.64	81.12	8.81	6'	Blue ls. with fine laminations.

OPERATING PROBLEMS Overburden varies in thickness from 0 to 5'. No deep clay seams or pinnacles were noted.

RESERVES Quarry location is favorable for considerable enlargement.

CLASSIFICATION Inactive, formerly produced agricultural lime. Suitable for agstone and crushed stone.

LOCALITY 14. Quarry

OWNER

LOCATION 0.6 mi. N of Yellow House

Oley TOWNSHIP

QUADRANGLE Reading

LAT. 0.06 mi. S of 40°20'N

LONG. 0.46 mi. W of 75°45'W

TRANSPORTATION 300 feet from quarry to highway, Penna. 662.

FORMATION Beekmantown

MEMBER Middle interbedded (?)

LITHOLOGY Dolomite with some interbedded limestone. The dolomite is gray and massive. The limestone is distinctly banded, contains chert lenses 1 to 2" thick and several feet long. Scattered sand grains are also present in the limestone.

STRUCTURE The beds strike N30°E and dip 30° to 35°NW.

SAMPLE LOCATION AND SEQUENCE Sample No. 38 is from the oldest beds sampled which were on the E side of the quarry. A covered interval of 15' separates these beds from samples No. 39 and No. 40 which were taken from beds on the W side of the quarry.

FACE HEIGHT about 40 feet.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
40	2.08		24.88	67.96	3.95	3'	Limestone including a 1" chert layer.
39	1.66		11.82	62.27	23.91	8'	Massive dolomite.
38	1.50		15.04	75.07	9.87	4'	Laminated ls., and dolomite.

OPERATING PROBLEMS Overburden is about 4' thick at the quarry. Opening is too small to judge the coverage thickness. Floor of the quarry is dry, and above the level of the drainage.

RESERVES Quarry is small opening along strike in side of a low hill. Large quantity of similar rock is available.

CLASSIFICATION Inactive, formerly operated for agricultural lime. Would probably be good source of crushed stone.

LOCALITY 15. Railroad Cut & Quarry OWNER Reading Railroad and Harvey Kerns

LOCATION 0.6 mi. S of West Leesport

Bern TOWNSHIP

QUADRANGLE Reading

LAT. 1.37 mi. N of 40°25'N

LONG. 2.50 mi. W of 75°55'W

TRANSPORTATION On the Reading RR., 0.6 mile of unimproved road to nearest paved road.

FORMATION Beekmantown

MEMBER Middle dolomite.

LITHOLOGY Gray, massive, fine crystalline dolomite, brownish-gray on weathered surface, with some calcite veining. No chert or shaly parting.

STRUCTURE In line with, and E of the gently W plunging syncline exposed at locality No. 20. But the fold is open and poorly defined in these exposures. The beds strike N40°W and dip 20°SW, being in the trough of the fold. A fault plane striking N80°E and dipping 20°S is exposed near the S end of the railroad cut.

SAMPLE LOCATION AND SEQUENCE Most of the samples were taken in the railroad cut, but the same beds are exposed in the quarry. The analyses are arranged in what is believed to be the proper stratigraphic sequence. No. 186 may overlap No. 172 somewhat, and No. 183 is separated from No. 186 by a covered interval of about 25'. See locality 20 for sketch map.

FACE HEIGHT About 30 feet.

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
186	1.12		3.26	57.11	39.21	30'	Partial exposure, only 18' exposed. & 186.
183	0.45	0.57	3.26	58.11	38.07	9'6"	Covered interval of 25' between 183 /
182	0.48	0.28	2.92	57.06	39.89	12'	Fault at top of this interval.
181	1.00		2.68	69.25	27.28	9'6"	
180	0.38	0.72	2.50	58.29	37.65	6'	
179	0.64	0.28	3.00	56.70	38.91	12'	
178	1.30		3.90	57.64	36.57	10'	
177	0.75	0.71	4.38	56.00	38.15	14'	Lowest beds exposed in the rr. cut.
185	1.38		4.58	57.28	37.37	12'	From the N end of the quarry.
184	1.00		5.78	55.87	37.15	10'	

OPERATING PROBLEMS Overburden is generally thin here. There is no water in the quarry, but the quarry on the W side of the railroad (locality No. 20) is partly filled with water.

RESERVES Largest reserves of these beds are W of the railroad, as most of the stone has been removed from the quarry on the east side.

CLASSIFICATION Inactive, formerly worked for agricultural lime or flux stone. Samples 179-182 represent 49' of dolomite, averaging 2.9% SiO₂ and would therefore be suitable for flux stone.

LOCALITY 16. Quarry

OWNER Mr. Sweitzer

LOCATION 0.3 mi. NW of Rickenbach

Bern TOWNSHIP

QUADRANGLE Reading

LAT. 0.65 mi. N of 40°25'N

LONG. 2.41 mi. W of 75°55'W

TRANSPORTATION 0.3 mile of hard surface road from the quarry to the railroad.

FORMATION Beekmantown

MEMBER Middle dolomite.

LITHOLOGY Gray, massive dolomite, with irregular nodules of black chert in one bed. Locally the dolomite shows fine lamination. A bed of shaly dolomite is exposed near the center of the quarry.

STRUCTURE The bedding is obscure due to massive nature of the rock and complex deformation. On the E side of the quarry the beds strike N80°W and dip 60°N, near the center a bedding plane strikes N10°W and dips 65°NW. Two fault planes are exposed, the most prominent strikes N65°E and dips 50°SE, while the other strikes N40°E with an 80°NW dip.

SAMPLE LOCATION AND SEQUENCE Stratigraphic sequence and thickness of the beds sampled is not known. No. 121 is from the E end of the quarry, No. 122 is from the center of the face and No. 123 from the W side.

FACE HEIGHT About 20 feet.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
121	1.66		8.10	54.09	36.32	15'	Massive dolomite.
122	1.64		4.80	61.67	39.07	25'	Laminated dl., including 4" shaly bed.
123	0.56	0.52	5.08	57.28	36.71	20'	Massive dl., jointed & faulted.

OPERATING PROBLEMS The thickness of overburden is irregular in the quarry. Average thickness is not known. The quarry is dry.

RESERVES Quarry could be enlarged to the N and NW with some increase in face height.

CLASSIFICATION Inactive, formerly produced agricultural lime. Analyses indicate it is a possible source of dolomitic agstone.

LOCALITY 17. Quarry

OWNER

LOCATION One mile NW of Kirbyville

Richmond TOWNSHIP

QUADRANGLE Reading

LAT. 1.21 mi. S of 40°30'N

LONG. 2.18 mi. W of 75°50'W

TRANSPORTATION One mile of hard-surface road from the quarry to highway U.S. 222.

FORMATION Beekmantown

MEMBER Upper Limestone

LITHOLOGY A 14-foot zone of blue, fine-grained, laminated limestone is overlain by interbedded limestone and dolomite. Bedding in the thick limestone zone is indistinct. The dolomite beds are gray, massive, with indistinct conglomerate texture in some beds.

STRUCTURE The beds strike N20°E and dip 18°NW.

SAMPLE LOCATION AND SEQUENCE Samples No's. 69 -73 are all from the thick limestone bed. Samples No's 74 - 78 are from the overlying beds, in correct sequence.

FACE HEIGHT About 20 feet.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
78	0.56		2.68	84.97	11.70	12'	Impure limestone and dolomite.
77	1.52		9.74	57.72	30.45	5'	Finely laminated gray dolomite.
76	1.10		9.60	75.30	14.15	9'	Gray magnesian ls. with shaly laminae.
75	1.02		7.38	72.46	18.92	4'6"	Gray magnesian ls.
74	1.20		8.04	74.06	16.59	7'6"	Light-gray magnesian ls. with dark patches
73	0.72		4.92	88.62	5.63	6'	Ls. bed, base not exposed.
72	0.44		5.68	89.80	3.74	11'	Ls. bed, base not exposed.
71	0.72		5.80	88.80	4.63	14'	Full thickness of the ls. bed.
70	0.62		6.68	86.16	3.43	13'	Ls. bed. Base not exposed.
69	0.50		4.94	89.15	5.19	8'6"	Ls. bed at NE end of quarry. Top and base not exposed.

OPERATING PROBLEMS The overburden averages about 5 feet thick. There is no water in the shallow quarry.

RESERVES More of the same type stone could be quarried by following strike or deepening quarry down dip.

CLASSIFICATION Inactive, formerly operated for agricultural lime.

LOCALITY 18. Hottenstein Quarry OWNER Mr. Dieter

LOCATION One mile E of Kutztown
QUADRANGLE Hamburg

Maxatawny TOWNSHIP

LAT. 1.13 mi. N of 40°30'N

LONG. 0.55 mi. W of 75°45'W

TRANSPORTATION 800 feet from quarry to railroad, rails have been removed from former spur. 0.7 mi. of secondary road and city street to highway U.S.222.

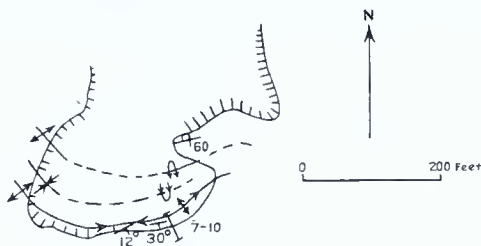
FORMATION Beekmantown

MEMBER Upper limestone.

LITHOLOGY Dense, blue, laminated, massive limestone in 10 to 20-foot zones separated by 1 to 4-foot beds of gray dolomite.

STRUCTURE Two asymmetrical anticlines are exposed in the quarry. They are overturned toward the north at the east end of the quarry, but not in the west face. Axes average strike about E-W, crests progressively lower to the north. Small break thrust is exposed in the east face. Principal joints strike and dip respectively: N60°E, Vert.; N80°E, 50°N; N68°E, 70°NW

SAMPLE LOCATION AND SEQUENCE Samples taken near east end of the south face. No. 7 is from oldest beds sampled. Analyses are in stratigraphic order.



FACE HEIGHT 70 feet.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
10	1.96		12.78	72.05	12.29	8'	Dolomitic ls. at top of face.
9	0.88		6.30	87.08	4.77	10'6"	Upper part of thick limestone.
8	0.90		8.78	88.85	1.33	17'	Lower part of thick ls. zone.
7	1.38		9.24	72.75	16.68	11'4"	Dolomite and some limestone.

OPERATING PROBLEMS Wells supplying water for Kutztown are adjacent to quarry and blasting might disturb the water supply. Water would be a problem if the quarry was deepened. Overburden is very variable. Limestone zones may be too thin for profitable operation.

RESERVES Drilling by the Allentown Portland Cement Co. failed to prove eastward extension of limestone beds. Beds should be repeated to the N of the quarry, but topography there is not favorable for quarrying.

CLASSIFICATION Inactive, formerly produced agricultural lime. Could produce a good agstone. Limestone zones are of acceptable quality for sweetening the mix at near-by cement plants.

LOCALITY 19. 2 quarries.

OWNER J. G. Hawley Estate.

LOCATION 1.1 mi. NW of Moselem Springs

Richmond TOWNSHIP

QUADRANGLE Reading

LAT. 0.13 mi. S of 40°30'N

LONG. 0.71 mi. W of 75°50'W

TRANSPORTATION 0.2 mi. to nearest paved road, 1.2 mi. from there to highway U. S. 222.

FORMATION Beekmantown

MEMBER Upper limestone.

LITHOLOGY Thick beds of blue, fine-grained, laminated limestone, with some scattered calcite grains separated by 6" to 4' beds of gray, finely crystalline dolomite. One bed of mottled limestone occurs in the southern quarry.

STRUCTURE In the NW quarry the beds strike N70°E and dip 18°NW. The SE quarry is on the crest of an anticline. The cleavage there strikes N90°E and dips 50°S.

SAMPLE LOCATION AND SEQUENCE The beds in the SE quarry are the oldest sampled. A covered interval of unknown thickness lies between the two quarries. The analyses are arranged in stratigraphic order. Samples No's. 85, 86, and 87 are from the SE quarry and the rest are from the NW quarry.

FACE HEIGHT 30 feet in the NW quarry and 15 feet in the SE quarry.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
83	1.18		6.16	69.62	22.74	3'6"	Thin-bedded, gray dl., weathered.
82	1.10		10.86	82.11	5.30	8'	Ls., 1' dl. at base not sampled.
81	1.02		5.18	82.99	11.55	7'	Blue ls. with faint laminations.
80	1.66		8.18	58.55	31.05	3'6"	Massive gray dl.
84	0.58		5.14	84.78	9.57	10'	Blue, massive ls.
87	2.02		10.86	55.34	31.74	5'	Weathered dolomite.
86	1.22		7.54	87.29	3.86	6'	Ls., with contorted laminations.
85	1.60		12.38	82.11	3.69	12'	Blue, fine-crystalline ls. and mottled ls.

OPERATING PROBLEMS Overburden variable, may be thick locally.

RESERVES Strike extension of these beds to the NE is indicated by outcrops but they are not repeated on the S-limb of the anticline.

CLASSIFICATION Inactive, formerly operated for agricultural lime. Suitable for agstone but not for cement limestone.

LOCALITY 20. Quarry

OWNER George Sillman

LOCATION 0.6 mi. S of West Leesport

Bern TOWNSHIP

QUADRANGLE Reading

LAT. 1.30 mi. N of 40°25'N

LONG. 2.55 mi. W of 75°55'W

TRANSPORTATION Adjacent to Reading RR., 0.6 mi. of unimproved road to nearest paved road.

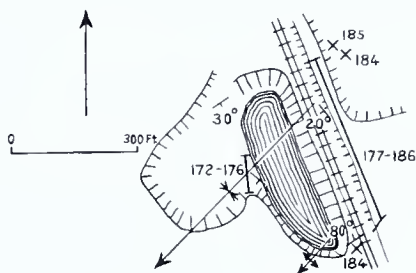
FORMATION Beekmantown.

MEMBER Upper limestone.

LITHOLOGY A zone of limestone 12' thick is overlain and underlain by massive dolomite. The limestone is blue, with silty laminations which stand out on weathered surfaces. A discontinuous 6" thick bed of dolomite occurs within the zone. Pyrite occurs in the dolomite just above the limestone zone.

STRUCTURE The quarry is opened on an irregular syncline striking N45°E and plunging 20°SW. The syncline has a wide, undulating trough and rather steeply-dipping limbs. A number of drag folds were observed plunging W conformably with the larger syncline.

SAMPLE LOCATION AND SEQUENCE Samples were taken from the water level up, near the center of the quarry. Analyses are arranged in stratigraphic order except No. 174 which is from the discontinuous dolomite bed.



FACE HEIGHT 45 feet above water level.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
176	1.16	0.66	2.56	58.47	37.45	9'	Gray dolomite.
175	1.16	0.50	4.22	60.58	33.42	7'6"	Gray dl., secondary pyrite.
173	0.64	0.82	5.84	86.79	5.69	12'	Blue laminated limestone.
172	0.79	0.45	4.70	60.33	34.00	13'	Massive, gray dolomite.
174	1.01	0.93	9.50	68.97	18.97	6"	Dl., discontinuous bed in the ls.

OPERATING PROBLEMS Overburden at the quarry is thin and regular. At least 10' of water stand in the quarry. The former operators are reported to have been flooded out.

RESERVES The beds sampled are not present E of the quarry because of the plunge of the fold, but could be followed westward.

CLASSIFICATION Inactive, formerly operated for agricultural lime. Suitable for agstone.

LOCALITY 21. Quarry

OWNER

LOCATION 0.6 mi. E of Kutztown

Maxatawny TOWNSHIP

QUADRANGLE Hamburg

LAT. 1.30 mi. N of 40°30'N

LONG. 1.82 mi. W of 75°45'W

TRANSPORTATION On Kutztown branch of the Reading RR. Secondary road and city streets connect with highway U.S. 222 in Kutztown.

FORMATION Beekmantown.

MEMBER Upper Limestone (?)

LITHOLOGY The lowest beds exposed are a thin-bedded, light-gray calcarenite, above are interbedded blue, fine-grained laminated limestone in beds 3 to 8' thick and gray, buff-weathering, dolomite in beds 1 to 3' thick. Some black chert is present.

STRUCTURE The bed strikes N35°E to N45°E and dip 25° to 35°SE. They are right side up. Some of the thinner dolomite beds show boudinage structure.

SAMPLE LOCATION AND SEQUENCE The quarry was worked along the strike of the beds, NE from the railroad tracks. Samples were taken from the quarry face, except for No. 6 which is from the railroad cut and is believed to be from rocks directly overlying the uppermost beds sampled in the quarry.

FACE HEIGHT 30 feet.

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
6	1.04		6.46	80.36	11.28	17'	Laminated limestone.
5	1.66		10.14	65.84	21.29	24'	Interbedded limestone and dolomite.
4	1.74		8.96	74.72	14.45	14'	Interbedded limestone and dolomite.
3	2.30		12.46	53.73	30.94	2'	Dolomite.
2	1.18		9.12	82.72	6.81	8'	Limestone with dolomite boudins.
1	0.94		12.54	82.90	2.80	12'	Calcarenite.

OPERATING PROBLEMS Overburden is not particularly thick. No water in quarry at present.

RESERVES Extension of the beds sampled to NE is limited by the road.

CLASSIFICATION Inactive, formerly produced agricultural lime or crushed stone. Suitable for agstone.

LOCALITY 22. Road Cut.

LOCATION 2.5 mi. N of Topton
QUADRANGLE Allentown West

Maxatawny TOWNSHIP
LAT. 2.87 mi. S of 40°35'N
LONG. 2.04 mi. W of 75°40'W

TRANSPORTATION On Route 222

FORMATION Beekmantown. MEMBER Uppermost.
LITHOLOGY Blue-gray limestone, some with fucoidal mottling.

STRUCTURE Beds strike N72°W and dip 15°SW

SAMPLE LOCATION AND SEQUENCE Sample taken from exposures on N side of the road.

ANALYSES OF SAMPLES							Remarks
No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
22	0.84	7.90	86.46	4.52	6'		

REMARKS

LOCALITY 23. Road cut and outcrop.

LOCATION 2 mi. NW of Yellow House
QUADRANGLE Reading

Oley TOWNSHIP
LAT. 0.72 mi. N of 40°20'N
LONG. 1.60 mi. W of 75°45'W

TRANSPORTATION 1 mile of gravel road to nearest paved road.

FORMATION Beekmantown. MEMBER Uppermost (?)
LITHOLOGY Blue, dense limestone with occasional fucoids and fine-grained calcarenite, fluted on weathered surface.

STRUCTURE At the road the beds strike N85°W and dip 40°S. They are right side up.

SAMPLE LOCATION AND SEQUENCE Sample No. 28 is from outcrops in the field, north of the location on the road. No. 29 is from the south side of the road.

ANALYSES OF SAMPLES							Remarks
No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
28	1.26	10.34	85.39	2.57	3' ±		Blue limestone.
29	1.30	11.40	83.05	3.27	5'		Calcarenite.

REMARKS

LOCALITY 24. Quarry

OWNER Fred C. Shirey

LOCATION 1.25 mi. NE of Limekiln

Oley TOWNSHIP

QUADRANGLE Reading

LAT. 1.81 mi. N of 40°20'N

LONG. 2.20 mi. W of 75°45'W

TRANSPORTATION 0.25 mi. to nearest improved gravel road, 0.75 mi. from there to nearest paved road.

FORMATION Beekmantown.

MEMBER Uppermost.

LITHOLOGY Thick-bedded limestone with dolomite interbeds. The limestone is dark-blue, very fine-grained and faintly laminated. Weathered surface is fluted.

Uppermost bed in quarry is weathered to friable, shaly limestone.

STRUCTURE The beds strike N72°W and dip 10°S. The contact with the Martinsburg shale is just W of the quarry, a short distance up the hill. The beds in the quarry dip under the shale.

SAMPLE LOCATION AND SEQUENCE The samples were taken near the center of the face, from the lowest exposed bed up. The analyses are reported in their stratigraphic order. No. 36 is a piece of float from the field above the face.

FACE HEIGHT About 30 feet.

ANALYSES OF SAMPLES							Remarks
No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
36	0.88		5.04	91.08	2.96		Dark-gray dense limestone.
35	3.02		15.84	64.76	15.34	3' ±	Weathered, shaly limestone.
34	0.92		3.10	92.69	2.83	4'	Bed thickens to 8' to S.
33	0.20	0.30	2.62	86.81	10.07	7'6"	Includes and 18" dolomite bed.
32	2.12		12.92	63.33	22.60	3'	Gray dolomite.

OPERATING PROBLEMS Overburden averages more than 6' thick but is variable.

RESERVES Overlying shale limits possibility of quarrying much further into the hill; but these beds could be followed along strike for some distance.

CLASSIFICATION Inactive, formerly operated for agricultural lime; 10 to 15' of the beds in the quarry are suitable for cement limestone.

LOCALITY 25. Quarry

LOCATION 2.75 mi. NW of Yellow House

Oley TOWNSHIP

QUADRANGLE Reading

LAT. 1.70 mi. N of 40°20'N

LONG. 1.86 mi. W of 75°45'W

TRANSPORTATION 0.5 mile to nearest paved road.

FORMATION Beekmantown.

MEMBER

LITHOLOGY Laminated blue limestone with interbedded gray dolomite.

STRUCTURE Beds strike N10°E and dip 5°NW.

SAMPLE LOCATION AND SEQUENCE Samples taken from freshest exposures in the quarry.
No. 374 overlies No. 373.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
374	0.20	0.64	0.60	92.71	5.85	4'	
373	0.40	0.24	1.18	78.85	19.33	8'	

REMARKS

LOCALITY 26. Quarry.

LOCATION 2.5 mi. NW of Yellow House.

Oley TOWNSHIP

QUADRANGLE Reading

LAT. 1.33 mi. N of 42°20'N

LONG. 1.80 mi. E of 75°50'W

TRANSPORTATION 0.3 mile of gravel road to nearest paved road.

FORMATION Beekmantown.

MEMBER

LITHOLOGY Hard, blue-gray dolomite and light-gray, soft, crystalline limestone.

STRUCTURE Beds strike N5°E and dip 5°NW.

SAMPLE LOCATION AND SEQUENCE Beds are exposed on N side of a partially-filled quarry. No. 375 is the youngest.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
375	1.80	2.00	8.80	54.80	32.60	2'4"	Hard, blue-gray dolomite.
376	1.00	1.34	7.16	58.72	31.78	4'3"	Same as No. 375.
377	0.20	0.24	1.84	93.49	4.32	3'	Light-gray, soft, "marble".

REMARKS

LOCALITY 27. Quarry OWNER Charles R. Angstadt
 LOCATION 0.8 mi. E of Limekiln Oley TOWNSHIP
 QUADRANGLE Reading LAT. 0.70 mi. N of 40°20'N
 LONG. 2.08 mi. W of 75°45'W
 TRANSPORTATION 0.5 mile improved road to nearest paved road.
 FORMATION Beekmantown MEMBER Uppermost.
 LITHOLOGY Dark-blue, fine-grained crystalline limestone in 6 to 8" beds and
 magnesian limestone with fucoidal mottling. Interbedded gray dolomite not
 sampled.

STRUCTURE Strike averages about N60°W, dip 30°SW. Beds are right side up and
 dip under beds of the Jacksonburg formation.

SAMPLE LOCATION AND SEQUENCE Samples are from beds exposed at the east end of
 the quarry. Sample No. 31 is from beds several feet higher in the section than
 No. 30.

FACE HEIGHT 15 feet.

No.	ANALYSES OF SAMPLES					Length	Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃		
31	1.22	7.80	74.54	15.94	10'	Mottled limestone.	
30	0.70	4.68	91.62	2.42	10'	Blue limestone.	

OPERATING PROBLEMS Outcrops are common in this area and average thickness of
 overburden is not large.

RESERVES Pure limestone bed probably has considerable strike extension but it
 is thin so the total quantity of stone available is not large.

CLASSIFICATION Sample No. 30 is acceptable to cement plants. All rock would make
 good agstone.

LOCALITY 28. Road Cut & Quarry OWNER

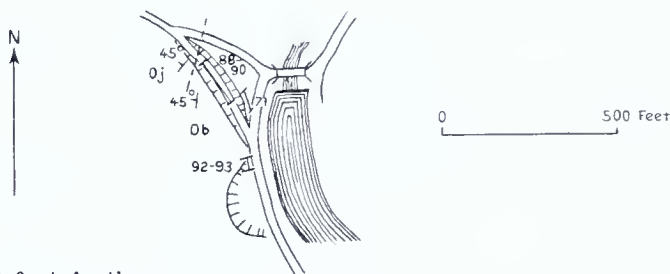
LOCATION 1.1 mi. NW of Moselem Springs Richmond TOWNSHIP
QUADRANGLE Reading LAT. 0.06 mi. S of 40°30'N.
LONG. 0.94 mi. W of 75°50'W.
TRANSPORTATION 1.1 mi. of hard-surface road to highway U.S. 222.

FORMATION Beekmantown MEMBER Uppermost.

LITHOLOGY Interbedded limestone and dolomite overlain by massive dolomite. Limestone beds are light-gray weathering blue limestone with carbonaceous laminae. Dolomite is gray, finely crystalline with lenticular black chert nodules in upper portion. Some of the chert is angular, apparently brecciated.

STRUCTURE Average strike of the beds is close to N23°E, dip 30°NW. Interbedded limestone and dolomite portion shows boudinage of the thinner dolomite beds and drag-folding in the limestones. Contact of the upper massive dolomite with the Jacksonburg is probably a fault. Strike in the Jacksonburg is N40°E, dip 45°NW, while the top of the dolomite strikes N5°E and dips 45°NW.

SAMPLE LOCATION AND SEQUENCE Analyses are listed in stratigraphic order. About 35' of beds are covered between No. 88 and No. 89, otherwise sequence is complete.



FACE HEIGHT 40 feet in the quarry.

ANALYSES OF SAMPLES							Remarks
No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
88	1.06	4.68	89.16	4.72	6' ±	In fault contact with Jacksonburg fm.	
89	0.66	2.88	56.83	40.09	15' +	35' covered between samples.	
90	1.38	10.10	53.99	35.24	20'	Black chert nodules.	
91	1.12	6.42	54.25	37.86	18'	Dolomite.	
92	0.26	2.58	94.15	2.80	10'	Blue limestone.	
93	0.82	5.90	84.50	8.86	14'	Blue ls., and thin dl. interbeds.	

OPERATING PROBLEMS Overburden may be locally thick. Quarry floor drains naturally into creek.

RESERVES Large quantity of this stone available in hill to SW of quarry face. Rock in road cut should be same as that in upper part of quarry.

CLASSIFICATION Inactive, possibly formerly operated for crushed stone and agricultural lime. The dolomite is too siliceous for flux stone.

LOCALITY 29. Quarry

OWNER Herbert Diefenbach

LOCATION 0.3 mi. NW of Host.

Tulpehocken TOWNSHIP

QUADRANGLE Wernersville

LAT. 0.02 mi. N of 40°25'N

LONG. 2.35 mi. W of 75°10'W

TRANSPORTATION 600' to two-lane concrete highway, 4 mi. to U.S. 422, and railroad at Womelsdorf.

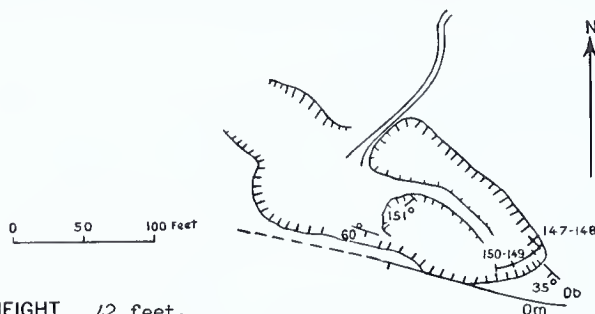
FORMATION Beekmantown

MEMBER Uppermost.

LITHOLOGY Interbedded limestone and dolomite including one 10' bed of massive limestone. Massive limestone is fluted on weathered surface, and indistinctly laminated. Above massive zone is more interbedded limestone and dolomite, which in turn is overlain by buff, soft, shale.

STRUCTURE Strike in Beekmantown varies from N35°W to N65°W. Dip is 40° to 60°SW. Bedding in shale is obscure. Contact strikes N55°W and dips irregularly SW. Contact can be seen to truncate the limestone beds, which are brecciated at the contact. Relations may be the result of thrusting or simply folding of an unconformity.

SAMPLE LOCATION AND SEQUENCE Samples all from SE end of the quarry. No. 147 is lowest bed exposed in that part of the quarry, and is the oldest unless beds are overturned. Analyses are arranged in stratigraphic order.



FACE HEIGHT 42 feet.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
151	0.79	1.95	6.74	72.70	17.40	25'	Alternating ls. and dl.
150	0.50	1.10	4.75	89.20	4.30	12'	Is., with scattered masses of dl.
149	0.70	1.42	5.84	80.50	10.61	13'	Alternating ls. and dl.
148	0.54	1.32	5.85	89.50	2.79	2'6"	Single ls. bed like those in No. 149.
147	1.74	2.67	12.33	50.03	32.93	1'6"	Single dl. bed like those in No. 149.

OPERATING PROBLEMS Overburden irregular but not heavy. No water is present in the quarry.

RESERVES Beds sampled could be followed SE on strike for at least 100'. Enlargement of quarry to SW (main face) is hindered by overlying shale.

CLASSIFICATION Agricultural lime produced intermittently for local use. Stone would make good agstone and crushed stone.

LOCALITY 30. Quarry

OWNER Lester Klopp

LOCATION 0.10 mi. SE of Host
QUADRANGLE Wernersville

Tulpehocken TOWNSHIP

LAT. 0.15 mi. S of 40°25'N
LONG. 2.04 mi. W of 76°10'W

TRANSPORTATION Adjacent to two-lane concrete highway; 3.75 mi. to RR and U.S.422 at Womelsdorf.

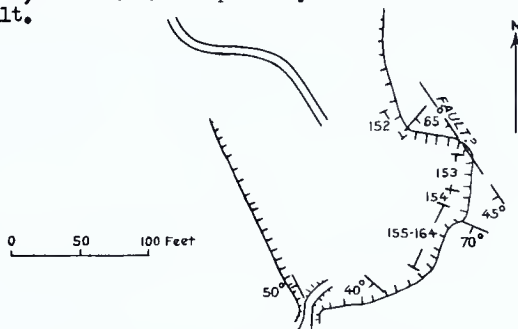
FORMATION Beekmantown

MEMBER Uppermost.

LITHOLOGY Massive dolomite and dolomitic limestone with limestone interbeds. The dolomite is gray, with faint lamination on bedding surface. Limestone is blue, massive or with fucoidal mottling and contains occasional crinoid fragments. A thin bed of limy shale may be a metabentonite.

STRUCTURE With one exception beds strike N15°W to N80°W. Normal strike may be about N20°W, with the N80°W and N50°E strikes representing drag on an exposed fault plane which strikes N30°W and dips 45°SW. Beds adjacent to fault and for several feet SE are severely contorted. Dips near fault are vertical and flatten to 40°SW away from the fault. The beds are probably right side up.

SAMPLE LOCATION AND SEQUENCE Samples all from SE face of the quarry. Sequence is uncertain, but No. 152 is probably the oldest rock sampled. All samples SE of the fault.



FACE HEIGHT 33 feet.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
162	0.75	0.91	2.71	55.00	40.30	6'	Mottled dl., and massive dl.
161	2.60		12.90	51.77	32.58	3'	Dl. and shale (metabentonite ?)
160	0.30	0.30	0.69	86.60	12.70	7'6"	Mottled ls. and dl.
159	0.24	0.52	1.71	65.16	31.94	4'3"	Massive dl. ments.
158	0.30	0.30	2.00	94.00	3.78	2'	Ls. with some fucoids, crinoid frag/
157	0.56		3.49	79.52	16.20	1'6"	Faintly laminated dl.
156	0.30	0.43	0.60	97.20	1.43	2'	Massive gray ls., some pyrite.
155	1.72		7.14	55.15	35.59	6'6"	Faintly laminated dl.
154	1.25	1.29	5.70	53.30	38.30	17'	Faintly laminated dl. in 1-4' beds.
153	1.02		5.50	63.30	29.36	27'	Contorted zone
152	0.37	0.60	1.44	86.00	11.50	25'	Bedding obscure, not true thickness.

OPERATING PROBLEMS Overburden 0-8' thick. No water in quarry.

RESERVES Extension of sampled beds 500' SE on strike is possible. Quantities of additional stone depends on the exact location of contact with the shale.

CLASSIFICATION Inactive, formerly operated for agricultural lime. Samples No's. 156 - 162 represent 26' of stone, averaging less than 3% SiO₂. More stone of flux quality may be present.

LOCALITY 31. Outcrops in pasture.

LOCATION 1 mile W of Womelsdorf
QUADRANGLE Wernersville

Marion TOWNSHIP

LAT. 2.60 mi. N of 40°20'N.
LONG. 2.38 mi. W of 76°10'W.

TRANSPORTATION Close to highway U.S. 422.

FORMATION Beekmantown

MEMBER Uppermost.

LITHOLOGY Blue-gray, finely-crystalline, laminated limestones. Brown, silty laminae stand out in relief on weathered surfaces.

STRUCTURE Beds strike N65°W, dip 55°S and are probably overturned.

SAMPLE LOCATION AND SEQUENCE Three widely separated outcrops were sampled. If beds are overturned No. 280 is older than No. 281. Relation of No. 284 to others is uncertain.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
281	0.80	0.50	4.04	86.42	8.24	3'	Dark-blue laminated ls.
280	0.70	0.20	6.10	78.07	14.93	5'	Exposure is not continuous.
284	0.60	0.64	4.84	88.38	5.54	3'	Gray, calcarenite, with fine lamination. Probably Beekmantown.

REMARKS A large quantity of this stone should be available here for crushed stone and agstone. Frequency of outcrops suggest relatively thin overburden.

LOCALITY 32. Quarry.

LOCATION 1.25 mi. NW of Robesonia.
QUADRANGLE Wernersville

Heidelberg TOWNSHIP

LAT. 2.65 mi. N of 40°20'N.
LONG. 3.75 mi. W of 76°05'W

TRANSPORTATION 1 mile of secondary road to nearest paved highway.

FORMATION Beekmantown

MEMBER

LITHOLOGY Laminated blue limestone. Cleavage is unusually well developed.

STRUCTURE Strike is about N90°W. The beds are overturned and dip steeply S. Laminations are strongly contorted.

SAMPLE LOCATION AND SEQUENCE Sample cut near center of small exposure.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
322	0.60	0.50	5.60	80.42	12.87	8' ?	Cleavage obscures bedding, making thickness measurement uncertain.

REMARKS

LOCALITY 33. Outcrop.

LOCATION 1.5 mi. N of Robesonia.

QUADRANGLE Wernersville.

Heidelberg TOWNSHIP

LAT. 3.04 mi. N of 40°20'N.

LONG. 1.07 mi. E of 76°10'W.

TRANSPORTATION 0.7 mi. to nearest paved highway.

FORMATION Beekmantown.

MEMBER Uppermost.

LITHOLOGY Light-gray crystalline limestone with patches and seams of darker gray.
Chalky white on weathered surface.

STRUCTURE Dip and strike not known. Near thrust contact with Martinsburg formation.

SAMPLE LOCATION AND SEQUENCE Sample taken from isolated pinnacle exposed in a trench dug for a pipeline.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
321	0.40	0.40	2.48	85.24	11.48	—	

REMARKS

LOCALITY 34. Outcrop.

LOCATION 2 mi. NW of Blandon

QUADRANGLE Reading

TOWNSHIP

LAT. 2.08 mi. N of 40°25'N.

LONG. 0.25 mi. W of 75°55'W.

TRANSPORTATION On paved road.

FORMATION Beekmantown

MEMBER

LITHOLOGY Gray calcarenite with silty laminations.

STRUCTURE Beds strike N80°W and dip 50°N.

SAMPLE LOCATION AND SEQUENCE Sample cut from outcrops on the N side of the road.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
208	0.45	2.64	10.36	80.45	3.44	8'	

REMARKS

LOCALITY 35. Quarry & Outcrops OWNER Clay Brown

LOCATION 1.6 mi. E of Limekiln
QUADRANGLE Reading

Oley TOWNSHIP

LAT. 0.88 mi. N of 40°20'N
LONG. 1.35 mi. W of 75°45'W

TRANSPORTATION 0.4 mi. of unimproved dirt road to nearest paved road.
Total of 0.8 mi. to highway Pa. 662.

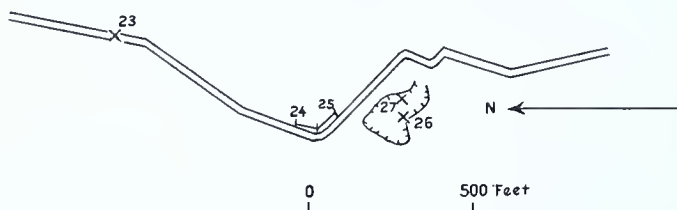
FORMATION Beekmantown

MEMBER

LITHOLOGY In quarry blue, fine-grained laminated limestone, locally mottled. Laminations prominent to indistinct on weathered surface. No dolomite in quarry, but gray dolomite and mottled limestone are exposed in lane near-by and dip under the bed in the quarry. Sample No. 23 is dark-blue limestone with some chert.

STRUCTURE Beds strike N5°W to N20°W and dip about 10°SW. No complications noted in limited exposures.

SAMPLE LOCATION AND SEQUENCE No. 24 underlies No. 25 and both underlie quarry samples. No. 27 underlies No. 26 directly. No. 23 is from lane 0.15 mile N of the quarry.



FACE HEIGHT 15 feet.

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
26	0.84	6.14	87.53	5.36	17'	Youngest in quarry, laminated blue ls.	
27	1.24	7.98	83.26	6.93	5'6"	Directly under No. 26.	
25	1.20	7.68	80.06	11.07	8'	Mottled ls., indistinctly laminated.	
24	0.98	7.30	74.72	16.90	?	Gray dl.	
23	1.48	10.56	58.71	29.19	25'	Incompletely exposed, blue ls.	

OPERATING PROBLEMS Overburden is 0 to 5' in the quarry. No water in present quarry floor, which is slightly above level of nearest stream.

RESERVES A thickness of 25' of limestone, averaging over 85% CaCO₃ is indicated. Horizontal extent is not known.

CLASSIFICATION Inactive, formerly operated for agricultural lime. Suitable for agstone and possibly cement limestone.

LOCALITY 37. Quarry

OWNER

LOCATION 2 mi. NW of Yellow House

Oley TOWNSHIP

QUADRANGLE Reading

LAT. 1.27 mi. N of 40°20'N

LONG. 0.78 mi. W of 75°45'W

TRANSPORTATION On highway Pa. 662.

FORMATION Beekmantown

MEMBER

LITHOLOGY Massive, blue-gray, fine-grained laminated limestone. Light-gray with brown silty laminae on weathered surface. Black chert in scattered irregular nodules. Some beds have abundant calcite grains.

STRUCTURE The beds strike N72°E and dip steeply N to vertical. Three joint systems were noted, striking and dipping, respectively: N75°E, 55°SE; N40°W, 45°SW; and N60°W, vertical. Most of the joints are filled with calcite and quartz crystals. Drag folds in the laminae pitch 30°W.

SAMPLE LOCATION AND SEQUENCE Sample includes most of the beds exposed in the quarry. The lower part of the section is not completely exposed.

FACE HEIGHT

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
37	0.62		7.36	87.88	3.47	40'	

OPERATING PROBLEMS No water in the pit. Outcrops rare here and average thickness of overburden may be high.

RESERVES

CLASSIFICATION Inactive, formerly operated for agricultural lime.

LOCALITY 38. Quarry

LOCATION 1 mile SE of Oley
QUADRANGLE Reading

LAT. 2.35 mi. S of 40°25'N
LONG. 0.90 mi. W of 75°45'W

Oley TOWNSHIP

TRANSPORTATION On highway Pa. 73.

FORMATION Beekmantown MEMBER
LITHOLOGY Massive gray dolomite limestone.

STRUCTURE Beds strike N10°E, 25° NW.

SAMPLE LOCATION AND SEQUENCE Quarry is partially filled in. Sample is from exposures on east side.

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
42	1.12		6.96	74.21	17.57	15'	

REMARKS

LOCALITY 39. Quarry

LOCATION 0.8 mi. NW of Moselem Springs.
QUADRANGLE Reading

LAT. 0.40 mi. S of 40°30' N
LONG. 0.90 mi. W of 75°50'W

Richmond TOWNSHIP

TRANSPORTATION 0.15 mile to nearest paved road; 0.8 mile from there to highway U. S. 222.

FORMATION Beekmantown MEMBER
LITHOLOGY Pinkish-gray calcarenite with silty laminae.

STRUCTURE The beds strike N20°E, dip 25°NW.

SAMPLE LOCATION AND SEQUENCE Sample from NW side of small pit now partly filled with trash.

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
79	1.60		12.86	82.40	2.73	6'	

REMARKS Overburden is only 1 to 2 feet thick.

LOCALITY 40. Quarry

OWNER

LOCATION 2 miles W of Wernersville

Lower Heidelberg TOWNSHIP

QUADRANGLE Wernersville

LAT. 0.54 mi. S of 40°20'N.

LONG. 2.19 mi. W of 76°00'W.

TRANSPORTATION Adjacent to highway U.S.422. 1 mile from RR Station in Sinking Spring.

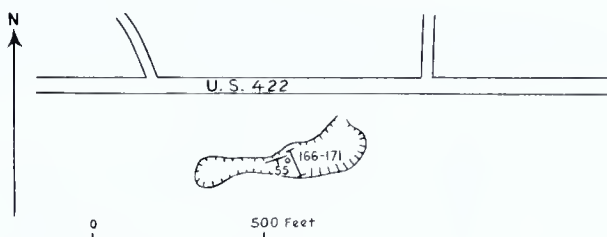
FORMATION Beekmantown

MEMBER

LITHOLOGY Interbedded massive dolomite and blue laminated limestone. One bed of limestone is light-gray to white, soft, crystalline, with indistinct laminations. Black chert is present in the dolomite and the blue limestone.

STRUCTURE Beds strike N62°E to N85°E. Dip averages 55°S except where beds are involved in a minor fold on the N side of the quarry.

SAMPLE LOCATION AND SEQUENCE Samples were taken across the floor and part way up the S face near the center of the quarry which is elongate parallel to the strike. Analyses are arranged in stratigraphic order.



FACE HEIGHT 40 feet at highest point.

ANALYSES OF SAMPLES							Remarks
No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
171	0.52	0.76	2.83	93.80	1.86	6'	Dolomite in S face.
170	0.85	0.88	5.77	71.35	20.73	6'	Dl. and some light-gray ls.
169	0.56		7.74	90.07	1.07	4'	Light-gray, crystalline ls.
168	0.80	1.43	8.08	69.50	20.10	15'	Dolomitic ls., chert & sand grains.
167	0.40		4.08	92.37	2.42	20'	Ls. with dl. boudins.
166	1.57	1.17	5.55	54.20	37.40	1'	Dl. with gash veins.

OPERATING PROBLEMS Overburden 5 to 6', but thickens at E end. Water stands near E end.

RESERVES Location favorable for small or medium-sized quarry. Little is known about extent of beds sampled.

CLASSIFICATION Inactive, formerly produced agricultural lime and flux stone (D'Inwillers 1887, p. 1560) for local furnaces. Not acceptable at present. Would be acceptable as a magnesian agstone.

LOCALITY 41. Quarry.

LOCATION 2.5 mi. S of West Leesport.

Bern TOWNSHIP

QUADRANGLE Reading

LAT. 0.64 mi. S of 40°25'N

LONG. 1.31 mi. E of 76°00'W

TRANSPORTATION 0.6 mile to nearest paved road.

FORMATION Beekmantown.

MEMBER Uppermost.

LITHOLOGY Laminated blue limestone. Laminations stand out as brown, silty ridges on weathered surface. Limestone is interbedded with massive gray dolomite.

STRUCTURE Beds strike about N18°E and dip 75°NW to vertical. Dolomite layers exhibit boudinage structure.

SAMPLE LOCATION AND SEQUENCE Samples are located at extreme N end of the quarry. Complex folding and/or faulting makes age relations difficult to determine. No. 332 lies W of No. 331.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
331	0.60	1.02	3.28	90.34	4.76	13'	
332	0.40	0.74	1.24	72.67	24.95	7'6"	

REMARKS The average low silica of these beds is typical of the uppermost portion of the formation. Similar purity at locality No. 42 suggests that further prospecting for flux stone in these beds in this area might be fruitful.

LOCALITY 42. Outcrops.

LOCATION 3 mi. S of West Leesport

Bern TOWNSHIP

QUADRANGLE Reading

LAT. 1.04 mi. S of 40°25'N.

LONG. 1.54 mi. E of 76°00'W

TRANSPORTATION

FORMATION Beekmantown

MEMBER Uppermost.

LITHOLOGY Gray, thick-bedded dolomite and blue limestone alternating with dolomite in 1 - 2 inch bands.

STRUCTURE Beds strike N10°E and dip 65°NW.

SAMPLE LOCATION AND SEQUENCE Samples taken from outcrops on the S bank of the Schuylkill River, at the water's edge. No. 335 directly overlies No. 334.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
335	0.40	0.66	1.34	79.74	17.86	7'	Banded ls. and dl.
334	0.60	0.58	1.90	65.80	31.12	7'	Gray dl., fetid when struck with hammer.

REMARKS Low silica suggests this area may be source of blast furnace flux.

LOCALITY 43. Dishong Quarry
and Roadcut.

OWNER Mr. Swope

LOCATION 0.5 mi. W of Stouchsburg.
QUADRANGLE Wernersville.

Marion TOWNSHIP

LAT. 2.27 mi. S of 40°25'N

LONG. 0.35 mi. E of 76°15'W

TRANSPORTATION Adjacent to highway U. S. 222.

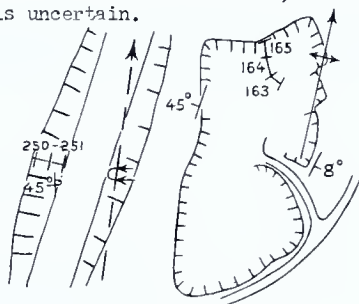
FORMATION Annville.

MEMBER Lower.

LITHOLOGY Thick-bedded, blue, finely crystalline limestone, strongly veined with calcite. Weathered surface shows well-developed fluting. Very little variation of lithology within the exposures.

STRUCTURE The crest of an anticline striking about N80°W and plunging gently W is exposed near the north side of the quarry. On the south side bedding strikes N70°W, dip 45°S. On the south side of the road the strike is N90°W, dip 45°S, overturned, indicating that the highway conceals the core of a very tight syncline. Joint systems in the quarry strike and dip respectively, N35°W, 80°S; N28°W, vert.; N70°E, 85°S; N35°W, 35°SW; N70°E, 85°S.

SAMPLE LOCATION AND SEQUENCE Samples 163, 164, 165 were taken at the W end of the quarry and include most of the beds exposed in the quarry. No. 163 is from the oldest beds. No's. 250 and 251 are from roadcut on S side of highway U.S. 222, S of the quarry. No. 250 is older than No. 251, but their relation to beds sampled in the quarry is uncertain.



FACE HEIGHT 35 feet.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
251	0.20	0.20	1.70	94.27	3.63	3'	Light-blue limestone.
250	0.40	0.78	1.12	94.07	3.63	5'6"	
165	0.44	0.82	1.77	95.00	2.20	13'	Blue ls. with calcite veins.
164	0.30	0.67	1.56	95.50	2.10	8'6"	
163	0.50	0.95	2.32	92.50	3.60	14'	

OPERATING PROBLEMS Overburden 0 - 8', rock surface rather uneven. No water in quarry.

RESERVES Very little additional stone from the beds sampled can be quarried at this locality due to recent highway construction.

CLASSIFICATION Quarry produced agricultural lime until 1950. Stone is chemically a high-calcium limestone and is suitable for flux, lime, cement limestone, etc.

LOCALITY 44. Outcrops on S bank of the Tulpehocken Creek.

LOCATION 1 mi. W of Stouchsburg.

Marion TOWNSHIP

QUADRANGLE Lebanon

LAT. 2.50 mi. S of 40°25'N

LONG. 0.12 mi. W of 76°15'W

TRANSPORTATION

FORMATION Annville.

MEMBER Lower.

LITHOLOGY Dove-gray, finely crystalline, thick-bedded limestone. Fluted on weathered surface. Beds lowest stratigraphically show faint color mottling. Some calcite veining.

STRUCTURE Strike averages N70°E. Dips from 70°N to 80°S, overturned.

SAMPLE LOCATION AND SEQUENCE Samples No's. 244, 245, 246 are a continuous sequence, No. 244 being the oldest. No. 247 is younger than No. 246 and is separated from it by less than 50 feet of covered beds.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
247	0.60	0.62	2.82	90.15	5.81	5'	Blue ls. in isolated outcrop.
246	0.10	0.39	1.08	93.29	5.14	9'	
245	0.40	0.36	1.36	94.67	3.21	9'	
244	0.40	0.60	1.50	95.84	1.66	7'	

REMARKS The beds sampled average less than 2% SiO₂ and are suitable for flux and other high-calicium purposes. Proximity of Tulpehocken Creek might cause serious water problem. Overburden appears generally thin here but nothing is known concerning clay seams.

LOCALITY 45. Old quarry, now partially filled.

LOCATION 1 mile W of Stouchsburg.

Marion TOWNSHIP

QUADRANGLE Lebanon

LAT. 2.22 mi. S of 40°25'N

LONG. on 76°15'W

TRANSPORTATION Adjacent to highway U.S. 422.

FORMATION Annville.

MEMBER Lower.

LITHOLOGY Blue, finely crystalline, laminated limestone. Weathers light-gray.

STRUCTURE Strike is N85°W to N90°W. Dip is 45°S, probably overturned. Very indistinct indication of cleavage dipping flatter than bedding. Prominent joint strike N60°E and dip 65°N. are paralleled by a "roll" in the bedding.

SAMPLE LOCATION AND SEQUENCE If beds are overturned, sample No. 248 is the older.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
249	0.20	0.82	1.50	93.88	3.60	4'	
248	0.40	0.64	1.92	94.17	2.87	4'	

REMARKS Beds sampled probably represent a continuation of those seen in the quarry on the Swope farm. New road construction eliminates possibility of any new quarry in the immediate vicinity.

LOCALITY 46. Outcrops.

LOCATION 0.5 mi. W of Stouchsburg.

Marion TOWNSHIP

QUADRANGLE Wernersville.

LAT. 2.35 mi. S of 40°25'N.

LONG. 0.67 mi. E of 76°15'W.

TRANSPORTATION Adjacent to new location of highway U. S. 422.

FORMATION Annville.

MEMBER Lower ?

LITHOLOGY Blue, finely crystalline limestone. Weathers to slaty fragments.

STRUCTURE Sample from near crest of a small fold whose axis strikes N60°E and plunges 10°SW.

SAMPLE LOCATION AND SEQUENCE Outcrop occurs in drainage ditch on south side of new highway.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
253	0.50	0.28	2.74	91.33	5.15	6'	

REMARKS Outcrop is one of several in the immediate vicinity. Probably represents to upper part of the lower member of the formation. Suitable for blast furnace flux and cement limestone.

LOCALITY 47. Outcrop.

LOCATION 1 mi. E of Stouchsburg.

Marion TOWNSHIP

QUADRANGLE Wernersville.

LAT. 2.87 mi. N of 40°20'N.

LONG. 1.82 mi. E of 76°15'W

TRANSPORTATION Adjacent to hard-surface road, 0.25 mile to highway U. S. 422.

FORMATION Annville.

MEMBER Lower.

LITHOLOGY Dove-gray, finely crystalline limestone. Some beds fluted on weathered surface.

STRUCTURE Beds strike N10°W and dip 30°SW, are probably overturned.

SAMPLE LOCATION AND SEQUENCE Outcrops occur in bank on west side of the road. If beds are overturned, No. 269 is oldest bed sampled.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
267	0.40	0.84	4.10	90.34	4.32	1'2"	Dove-gray finely crystalline ls.
268	0.20	0.48	0.98	95.45	2.89	6"	Similar rock but not fluted.
269	1.00	0.20	1.90	92.31	4.59	3'	Fluted on weathered surface.

REMARKS Absence of fluting may be related to very low silica content of No. 268.

LOCALITY 48. Outcrops.

OWNER

LOCATION 0.8 mi. E of Stouchsburg.

Marion TOWNSHIP

QUADRANGLE Wernersville

LAT. 3.00 mi. N of 40°20'N.

LONG. 1.75 mi. E of 76°15'W.

TRANSPORTATION 0.10 mi. to new location of highway U. S. 422.

FORMATION Annville

MEMBER Lower.

LITHOLOGY Massive, dove-gray, crystalline limestone, usually fluted on weathered surface.

STRUCTURE The beds strike N45°W and dip 15°SW. They are probably right side up, but proof if lacking.

SAMPLE LOCATION AND SEQUENCE Samples No's 286 to 289 are from ledge outcrops in the woods at the S edge of the field. The analyses are arranged in stratigraphic order assuming the beds are not overturned. The other two analyses are from isolated outcrops in the field.

FACE HEIGHT

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
289	0.40	0.98	2.94	92.31	3.37	5'	From ledges in woods.
288	0.50	0.60	3.06	91.62	4.22	3'	
287	0.40	0.30	1.58	94.96	2.76	4'	
286	0.40	0.88	3.24	93.29	2.19	5'	
285	0.30	0.76	2.32	91.33	5.29	—	Outcrop near S edge of field.
290	0.20	0.26	1.36	94.27	3.91	—	Outcrop in NW corner of field.

OPERATING PROBLEMS Overburden probably generally thin in woods, but outcrops in field are pinnacles and deep-clay seams may exist. Field rises gently away from road and in early stages quarry could be self-draining.

RESERVES It seems likely that a large quarry could be opened here in stone of this quality.

CLASSIFICATION Average grade of stone is suitable for blast furnace flux. Also, excellent for agstone, cement, limestone, etc.

LOCALITY 49. Outcrop. OWNER
LOCATION 1.5 mi. NW of Womelsdorf. Marion TOWNSHIP
QUADRANGLE Wernersville. LAT. 2.77 mi. N of 40°20'N.
LONG. 1.85 mi. E of 76°15'W.
TRANSPORTATION 0.2 mile to nearest paved road.
FORMATION Annville MEMBER Lower
LITHOLOGY Gray crystalline limestone; thick-bedded.

STRUCTURE

SAMPLE LOCATION AND SEQUENCE Outcrops located in woods on south side of
Tulpahocken Creek. Sample No. 295 is oldest in sequence.

FACE HEIGHT

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
297	0.20	1.00	1.62	94.77	2.41	9' 10'	covered between No.296 & No.297.
296	0.20	0.54	2.22	93.69	3.35	4'6"	
295	0.40	0.70	1.62	94.57	2.71	4'6"	

OPERATING PROBLEMS

RESERVES Probably at least 28' of stone suitable for blast furnace flux here.
Strike extension to the SE is probable.

CLASSIFICATION

LOCALITY 50. Roadcut

OWNER

LOCATION 1.75 mi. NW of Womersdorf.

Marion TOWNSHIP

QUADRANGLE Wernersville

LAT. 3.12 mi. N of 40°20'N.

LONG. 1.83 mi. E of 76°15'W

TRANSPORTATION On new location of highway U. S. 422.

FORMATION Annville.

MEMBER Upper.

LITHOLOGY Dark, blue-gray, thin-bedded, dense limestone. Weathers to light-gray, platy fragments. Weathered ledges have fluted surfaces. A few beds of gray, thin-bedded calcarenite in the section; 3 or possibly 4 beds of greenish-brown sericitic shale in the lower part of the section may be metabentonite.

STRUCTURE The beds strike N45°W to N55°W and dip averages about 40°SW. It is possible that there is some repetition of beds in the lower part of the section.

SAMPLE LOCATION AND SEQUENCE Analyses are arranged in stratigraphic sequence. Samples were collected from exposures on the N. side of the new highway.

FACE HEIGHT

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
255	0.40	0.52	4.92	87.79	6.37	4'7"	Includes 1" bed of calcarenite at / base.
256	0.70	1.14	6.06	85.92	6.18	10'	Blue-gray ls.
257	0.70	1.44	6.44	85.63	5.79	4'	Weathered ls.
258	0.70	0.24	5.86	86.42	6.78	23'	Thin-bedded, blue-gray ls.
259	0.90	0.74	5.90	87.40	5.06	3'2"	Calcarenite.
260	0.70	0.30	3.90	89.36	5.74	1'6"	Calcarenite.
261	0.70	1.62	8.50	83.96	5.22	9'3"	Dark-gray ls., weathered.
262	1.10	2.00	6.10	86.02	4.78	7'	Dark, blue-gray ls. grains.
263	1.10	1.64	6.72	85.92	4.62	3'2"	Dark, blue-gray ls. with calciate /
264	0.70	0.94	5.26	86.42	6.68	3'	Dark, blue-gray, finely crystalline
265	0.80	1.20	4.36	85.43	8.21	4'	Dense, blue-gray ls.
266	0.70	0.86	5.16	87.40	5.88	4'	Blue-gray, finely crystalline ls.

OPERATING PROBLEMS The overburden here is variable, 1 to 10' thick.

RESERVES These beds could be quarried N. of the highway.

CLASSIFICATION This stone would make excellent agstone and in part would be suitable for cement limestone.

LOCALITY 51. Outcrop.

LOCATION 0.5 mi. NW of Stouchsburg.

Marion TOWNSHIP

QUADRANGLE Wernersville.

LAT. 3.52 mi. N of 40°20'N.

LONG. 0.57 mi. E of 76°15'W.

TRANSPORTATION 0.1 mile to highway U. S. 422.

FORMATION Annville.

MEMBER Upper.

LITHOLOGY Dark-gray, dense, thin-bedded limestone with a few thin layers of calcarenite.

STRUCTURE Strike about N90°W; reliable dip not obtained.

SAMPLE LOCATION AND SEQUENCE Sample from exposures in bed of abandoned road.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
252	0.30	0.62	3.42	90.74	4.92	6'	Thickness approximate.

REMARKS Adjacent fields have abundant float, suggesting generally thin overburden. Although not high-calcium stone, it would make acceptable cement limestone.

LOCALITY 52. Outcrop.

LOCATION 0.25 mi. E of Stouchsburg.

Marion TOWNSHIP

QUADRANGLE Wernersville.

LAT. 3.18 mi. N of 40°20'N.

LONG. 1.27 mi. E of 76°15'W.

TRANSPORTATION Adjacent to new location of highway U. S. 422.

FORMATION Annville.

MEMBER Upper.

LITHOLOGY Dense, dark-gray, thin-bedded limestone. Fluted on weathered surface.

STRUCTURE Beds strike N90°E 25°S. No visible change.

SAMPLE LOCATION AND SEQUENCE Outcrop in drainage ditch on the S. side of the new highway.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
254	0.60	1.28	6.62	76.11	15.39	5'	

REMARKS Analysis shows unusually high-magnesium content for the Annville formation. Suitable only for agricultural limestone.

LOCALITY 53. Abandoned and partly filled quarry.

LOCATION 0.5 mi. NW of center of Womelsdorf.

Marion TOWNSHIP

QUADRANGLE Wernersville.

LAT. 2.62 mi. N of 40°20'N.

LONG. 1.35 mi. W of 76°10'W.

TRANSPORTATION A few yards from new location of highway U. S. 422.

FORMATION Annville.

MEMBER Upper.

LITHOLOGY Blue, dense, thin-bedded limestone. Beds 1 to 3" thick.

STRUCTURE Series of small folds exposed in the low face. Axial planes strike about N75°W and dip 60°S. Folds plunge gently east. Small fault offsets the fold axes.

SAMPLE LOCATION AND SEQUENCE Sample No. 277 from S. limb of northernmost syncline. Relation to No. 278 unknown because of fault. No. 278 and No. 279 are on S. limb of the anticline; No. 278 being the oldest.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
277	0.60	1.12	6.30	86.02	5.96	11'	
279	0.60	0.90	6.28	86.81	5.41	3'10"	
278	0.60	0.24	8.30	83.96	6.90	8'	

REMARKS Chemical nature suited for agstone. Quarry formerly produced agricultural lime. No large quantity of this stone is available in the immediate vicinity.

LOCALITY 54. Outcrops in a field.

LOCATION 1.5 mi. W of Womelsdorf.

Marion TOWNSHIP

QUADRANGLE Wernersville.

LAT. 2.75 mi. N of 40°20'N.

LONG. 2.40 mi. W of 76°10'W.

TRANSPORTATION 1.5 mile to nearest paved highway.

FORMATION Annville.

MEMBER Upper.

LITHOLOGY Dark-gray, thin-bedded limestone.

STRUCTURE Beds strike N5°E and dip 45°W. Stratigraphic sequence indicates probable overturning.

SAMPLE LOCATION AND SEQUENCE Samples separated by a few feet of covered beds. No. 283 is probably the older.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
282	0.40	0.28	4.10	89.17	6.05	1'6"	
283	0.40	0.44	4.56	87.40	7.20	2'	

REMARKS Presence of Upper Annville here suggest that the lower member is in the covered interval between these outcrops and locality No. 31.

LOCALITY 55. Outcrops in road bank.

LOCATION 1.5 mi. W of Wernersville.
QUADRANGLE Wernersville.

Lower Heidelberg TOWNSHIP

LAT. 0.27 mi. N of 40°20'N.

LONG. 1.19 mi. W of 76°05'W

TRANSPORTATION Adjacent to highway U. S. 422.

FORMATION Annville.

MEMBER Upper ?

LITHOLOGY Dark-blue, finely crystalline, thin-bedded limestone. Weathers light-blueish-gray with light and dark striations on the bedding surfaces. A few scattered fragments of crinoid stems.

STRUCTURE Near crest of anticline striking about N75°W, plunging E.

SAMPLE LOCATION AND SEQUENCE Samples are from two outcrops on the N. side of the highway. No. 305 is probably the older.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
306	1.00	1.50	7.24	80.33	9.93	3'	
305	0.60	0.40	5.76	86.42	6.82	3'	

REMARKS Overburden is generally thin in this area. Large quarry in this rock would be possible, although proximity of the highway might present some problems. The rock sampled is not notably pure, but the lower member may be present relatively shallow depth in the crest of the fold.

LOCALITY 56. Outcrop in field.

LOCATION 1.5 mi. W of Wernersville.
QUADRANGLE Wernersville.

Lower Heidelberg TOWNSHIP

LAT. 0.30 mi. N of 40°20'N

LONG. 1.14 mi. W of 76°05'W

TRANSPORTATION 0.05 mi. to highway U. S. 422.

FORMATION Annville.

MEMBER Upper.

LITHOLOGY Dark-blue, dense, thin-bedded limestone with crinoid fragments.

STRUCTURE Beds strike N80°E and dip 15°S.

SAMPLE LOCATION AND SEQUENCE Sample is from a dip slope exposure of only a few thin beds.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
307	0.72	0.40	4.28	87.40	7.20	2'	

REMARKS

LOCALITY 57. Outcrops in roadcut.

LOCATION 1.5 mi. W of Wernersville.

Lower Heidelberg TOWNSHIP

QUADRANGLE Wernersville.

LAT. 0.30 mi. N of 40°20'N

LONG. 1.29 mi. W of 76°05'W

TRANSPORTATION Adjacent to highway U. S. 422.

FORMATION Annville.

MEMBER Upper.

LITHOLOGY Dense, blue-gray, thin-bedded ls. with calcarenite layers. Crinoid fragments associated especially with the calcarenite. Two layers of sericitic shale, separated by 4" of ls., are interpreted as metabentonite.

STRUCTURE Average strike N50°W, dip about 25°NE. Bedding planes uneven. Faint cleavage N75°W to N85°W, dipping 65°S.

SAMPLE LOCATION AND SEQUENCE Sample No. 308 is from N side of highway and relation to others is uncertain. No. 310 overlies No. 309 on the south side of the highway.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks.
308	0.80	0.66	3.94	87.40	7.20	5'4"	
310	1.20	3.24	8.64	81.51	5.41	2' ±	Metabentonite not included.
309	1.00	3.40	10.36	75.81	9.43	3'6"	

REMARKS

LOCALITY 58. Abandoned Quarry.

LOCATION 2 mi. NW of Wernersville.

Lower Heidelberg TOWNSHIP

QUADRANGLE Wernersville.

LAT. 0.97 mi. N of 40°20'N.

LONG. 1.54 mi. W of 76°05'W.

TRANSPORTATION 0.5 mile of improved road to highway U. S. 422.

FORMATION Annville

MEMBER Upper.

LITHOLOGY Blue, dense limestone.

STRUCTURE

SAMPLE LOCATION AND SEQUENCE Samples from E. end of small, partially filled quarry. No. 313 overlies No. 314.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
313	0.80	0.94	8.00	84.06	6.20	6'6"	
314	1.10	1.66	9.16	80.03	8.05	6' ±	

REMARKS

LOCALITY 59. Outcrops

OWNER

LOCATION 2.75 mi. S of West Leesport.

Bern TOWNSHIP

QUADRANGLE Reading

LAT. 1.00 mi. S of 40°25'N

LONG. 1.35 mi. E of 76°00'W

TRANSPORTATION 0.5 mile to nearest road, 0.75 mile from there to highway Pa.83.

FORMATION Jacksonburg.

MEMBER

LITHOLOGY At the base of the section dark-gray slaty limestone, bedding obscured by the cleavage. Grades up into gray finely crystalline limestone in beds up to 8" thick with well-developed slaty cleavage. Bedding is distinguished easily on weathered surface by variations in shade of color. Some beds show small gash veins filled with calcite and some quartz.

STRUCTURE Relatively broad N. plunging syncline complicated by minor folding and broken by high-angle strike faults, with probable reverse movement. Cleavage strike N80°W to N-S, dips 80°E to 85°E. Offset of bedding on cleavage planes is visible, indicating shear folding.

SAMPLE LOCATION AND SEQUENCE Section is exposed in cliffs on the S. bank of the Schuylkill River. Samples No's. 336 to 350 are from the E. limb of the syncline and represent a complete stratigraphic section except where interrupted by faulting. Length was measured perpendicular to cleavage where bedding is obscure in the lower part of the section. The analyses are arranged in stratigraphic order. Samples No's. 351 to 353 (see next page) are from the W. limb of the syncline.

FACE HEIGHT

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
350	1.70	3.62	19.00	68.74	6.94	36'	Ends at highest beds. section.
349	1.60	3.20	18.56	68.74	7.90	12' ±	Bedding obscure, fault at top of /
348	1.60	3.44	18.16	67.76	9.04	13'	Well-bedded, fault at top of section.
347	1.60	4.74	17.80	69.03	6.83	24'	
346	1.40	3.70	20.40	66.78	7.72	35'	to 8" thick.
345	1.40	2.24	12.02	76.79	7.55	14'	Gray, fine-crystalline ls., beds up /
344	1.40	2.72	20.00	68.15	7.73	20'	
343	1.40	2.66	13.22	76.11	6.61	10'	Fault at top of section.
342	1.60	4.18	17.66	68.54	8.02	25'	
341	1.80	3.78	15.52	70.61	8.29	20' ±	Drag folds visible.
340	1.20	3.12	17.70	69.23	8.75	13'6"	Gray slaty limestone.
339	1.60	4.40	23.52	62.65	7.83	12'	Bedding assumed parallel to cleavage.
338	1.40	3.74	20.12	68.15	6.59	12'	
337	1.20	5.76	25.84	60.00	7.20	9'6"	
336	1.40	3.48	18.96	69.03	7.13	17'	

OPERATING PROBLEMS Talus from the Martinsburg escarpment may be thick over some of the cement rock.

RESERVES There is room for a large quarry in the strike extension of these beds S. of the river.

CLASSIFICATION Most of this rock would require addition of cement limestone to be of use in cement manufacture.

LOCALITY 59. (continued)

OWNER

LOCATION
QUADRANGLE

LAT.
LONG.

TOWNSHIP

TRANSPORTATION

FORMATION
LITHOLOGY

MEMBER

STRUCTURE

SAMPLE LOCATION AND SEQUENCE `See above. Analyses are arranged in stratigraphic order.

FACE HEIGHT

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
351	1.60	4.58	16.80	68.74	8.28	11'	Fault at top of section.
352	1.70	3.64	18.14	67.76	8.76	22'	
353	1.30	4.00	19.14	68.35	7.21	21'	

OPERATING PROBLEMS

RESERVES

CLASSIFICATION

LOCALITY 60. Roadcut.

OWNER

LOCATION At E end of Kutztown Borough

TOWNSHIP

QUADRANGLE Hamburg

LAT. 2.00 mi. N of 40°30'N.

LONG. 0.90 mi. W of 75°45'W.

TRANSPORTATION On highway U.S. 222.

FORMATION Jacksonburg

MEMBER

LITHOLOGY Dark-gray, graphitic shaly limestone with well-developed, slaty cleavage. Bedding in weathered surface shows as light and dark-gray bands.

STRUCTURE The beds strike N65°E and dip 80°SE, overturned. Veins of calcite cut the rock lying nearly horizontal except where thrown into small drag folds.

SAMPLE LOCATION AND SEQUENCE Samples No's. 362 to 367 are from the north side of the cut, while the rest are from the south side. The analyses are arranged in stratigraphic order.

FACE HEIGHT

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
367	1.20	3.20	15.26	72.08	8.26	15'	
366	1.80	4.28	15.92	68.84	9.16	23'	
365	2.00	5.26	17.14	66.78	8.82	21'6"	
364	1.70	4.36	5.12	70.61	8.21	10'6"	
363	1.80	4.50	18.90	65.01	9.79	13'	
362	1.70	5.10	18.50	65.99	8.71	13'4"	
368	1.60	4.36	16.06	67.76	10.22	11'	May overlap No.362, in part.
369	2.00	4.56	18.24	61.18	14.02	22'	
370	2.00	3.64	19.32	64.42	10.62	23'	
371	1.60	4.64	24.40	59.90	9.46	10'6"	
372	1.40	4.18	24.38	62.26	7.78	15'	

OPERATING PROBLEMS

RESERVES Proximity of built-up area limits reserves here.

CLASSIFICATION This stone is a somewhat magnesian cement rock.

LOCALITY 61. Roadcut.

OWNER

LOCATION 1.25 mi. W of Stouchsburg

Marion TOWNSHIP

QUADRANGLE Lebanon

LAT. 2.22 mi. S of 46°25'N.

LONG. 0.37 mi. W of 76°15'W.

TRANSPORTATION On highway U.S. 422.

FORMATION Jacksonburg

MEMBER

LITHOLOGY Dark-gray shaly limestone, brownish-gray on the weathered surface. Has local extensive calcite veining. Some beds show deep weathering to non-calcareous, porous shale.

STRUCTURE The beds exposed are on the NE limb of a syncline separated from the main outcrop of the Jacksonsburg formation by an anticlinal belt of limestone conglomerate. The syncline is complicated by drag folding. The folds all plunge SE. The beds strike N50°E and dip 45°SE, and the strike swings to N70°E in the western part of the exposures.

SAMPLE LOCATION AND SEQUENCE Exposures are in road cuts at intersection of highway U.S. 422 and a side road. All are from exposures south of the highway. No. 237 is from the east side of the road, No's 238 to 240 are from the west side of the road, and No's. 241 to 243 are from the southeast corner of the intersection. The section is not continuous. The analyses are arranged as nearly as possible in stratigraphic order.

FACE HEIGHT

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
237	2.00	6.54	33.70	51.06	6.70	6'	On east side of road.
238	2.00	3.58	23.76	60.69	9.97	9'	Fartly weathered.
239	2.00	5.74	27.24	57.93	7.09	10'	Weathered.
240	2.20	5.84	23.94	55.97	12.05	15'	
241	0.40	7.20	28.18	54.99	9.23	7'	May overlap all or part of No.240.
242	1.80	6.16	29.32	54.99	7.73	5'	
243	2.40	5.04	27.20	57.93	7.43	5'	About 4' of covered beds between top of this sample and No. 242.

OPERATING PROBLEMS

RESERVES

CLASSIFICATION This stone is not chemically suited for any of the common uses of limestone except possibly wool rock.

LOCALITY 62. Quarry.

OWNER

LOCATION 0.75 mile NW of Womelsdorf.

Marion TOWNSHIP

QUADRANGLE Wernersville

LAT. 2.70 mi. N of 40°20'N.

LONG. 1.73 mi. W of 76°10'W.

TRANSPORTATION Near new location of highway U.S. 422.

FORMATION Jacksonburg

MEMBER Limestone conglomerate (?)

LITHOLOGY Dark blue-gray, dense limestone. Weathered surface shows light-gray and brownish-gray bands. Rock is hard and breaks with conchoidal fracture. A few thin beds of limestone conglomerate. At the west end of the quarry is dark-gray shaly limestone and limestone conglomerate.

STRUCTURE The quarry is on the axis of an anticline which strikes N75°W. The axis is nearly horizontal through most of the quarry and plunges sharply west at the west end.

SAMPLE LOCATION AND SEQUENCE Samples No's. 270 to 273 are from the face and quarry floor near the west end. Samples No's. 274 to 276 are from the beds in the steeply plunging part of the fold.

FACE HEIGHT 20 feet ±

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
276	0.50	0.34	5.16	88.38	5.62	4'6"	Shaly ls. and ls. conglomerate.
275	0.80	1.16	7.12	83.27	7.65	4'6"	Dark-gray, dense shaly limestone.
274	0.60	0.80	6.66	84.65	7.29	8'	In floor of quarry, only partly exposed.
273	0.90	2.06	12.44	78.07	6.53	6'6"	Directly under #274, relation to #272 uncertain.
272	1.20	1.46	13.80	74.43	9.11	3'	From quarry face. Banded ls.
271	0.80	1.90	13.22	74.24	9.84	7'	Banded ls.
270	0.90	1.70	10.42	77.97	9.01	4'2"	Includes a 4" bed of ls. conglomerate.

OPERATING PROBLEMS Overburden is generally thin in this area. No water in the quarry.

RESERVES

CLASSIFICATION Inactive, formerly produced agricultural lime and possibly building stone for near-by canal lock.

LOCALITY 63. Roadcut.

LOCATION 2 mi. NW of Womelsdorf.

Marion TOWNSHIP

QUADRANGLE Wernersville.

LAT. 1.85 mi. S of 40°25'N.

LONG. 1.82 mi. W of 76°10'W.

TRANSPORTATION On paved road, 0.1 mi. to highway.

FORMATION Jacksonburg.

MEMBER

LITHOLOGY Gray to dark-gray, finely crystalline to shaly, laminated limestone.

STRUCTURE Bedding extensively crumpled. Strike averages about N90°W and the overall dip is 35°N. Cleavage strike N 85°W and dips 20°S. Fold axes plunge 8°W.

SAMPLE LOCATION AND SEQUENCE Exposures of relatively fresh rock on E. side of road were sampled. No. 291 is the older.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks.
292	1.60	4.96	34.10	54.01	5.33	4'4"	
291	1.60	3.64	34.14	54.20	3.42	4'	Leached beds not included in the sample.

REMARKS

LOCALITY 64. Outcrops.

LOCATION 3 mi. NW of Womelsdorf.

Marion TOWNSHIP

QUADRANGLE Wernersville.

LAT. 1.24 mi. S of 40°25'N.

LONG. 1.42 mi. E of 76°15'W.

TRANSPORTATION 0.1 mile to nearest paved road.

FORMATION Jacksonburg.

MEMBER

Beds immediately overlying conglomerate member.

LITHOLOGY Gray, impure shaly ls.

Brownish on weathered surface.

STRUCTURE Beds strike N85°W and dip 45°S. At locality of No. 294 cleavage indicates beds are overturned.

SAMPLE LOCATION AND SEQUENCE Sample No. 293 from exposure at entrance to a farm lane. Sample No. 294 is from road bank 15 yards north of the first locality.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
294	1.80	5.50	24.24	63.63	4.83	8' ±	
293	1.80	4.40	11.18	57.15	25.47	2'	

REMARKS

LOCALITY 65. Outcrop.

LOCATION 1 mi. NW of Womelsdorf.

Marion TOWNSHIP

QUADRANGLE Wernersville.

LAT. 2.60 mi. N of 40°20'N.

LONG. 2.03 mi. W of 76°10'W.

TRANSPORTATION 0.2 mile to nearest paved highway.

FORMATION Jacksonburg ?

MEMBER

LITHOLOGY Dark blue-gray, dense, thin-bedded limestone. Weathers to brownish-gray, shaly chips.

STRUCTURE Axis of nearly recumbent syncline exposed. Strike is N60°W and plunge of axis is about 5°E.

SAMPLE LOCATION AND SEQUENCE Samples taken from upper limb of syncline. Length of sample does not represent stratigraphic thickness. Sample No. 300 is oldest.

ANALYSES OF SAMPLES							Remarks
No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
298	1.20	0.20	10.36	82.00	6.24	9'6"	
299	0.80	1.00	10.84	81.31	6.05	5'6"	
300	0.60	0.62	6.80	85.43	6.55	3'	

REMARKS Chemical analysis shows these rocks not typical of Jacksonburg of this region. Silica is a little low and magnesia is high for ideal cement rock.

LOCALITY 66. Abandoned Quarry.

LOCATION 1 mi. NW of Womelsdorf.

Marion TOWNSHIP

QUADRANGLE Wernersville.

LAT. 2.83 mi. N of 40°20'N.

LONG. 2.00 mi. W of 76°10'W.

TRANSPORTATION

FORMATION Jacksonburg

MEMBER

LITHOLOGY Black, graphitic, thin-bedded limestone.

STRUCTURE Beds strike N85°W. Surface is curved and appears to be the trough of a recumbent syncline.

SAMPLE LOCATION AND SEQUENCE Due to an error samples were taken without regard to structure. Lengths do not represent stratigraphic thickness.

ANALYSES OF SAMPLES							Remarks
No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
301	2.00	2.62	21.30	63.34	10.74	9'	Cut vertically on face.
302	2.20	4.30	20.60	61.67	11.23	19'8"	Horizontal cut, W. end of face
303	2.00	3.88	17.10	67.95	9.07	25'	Center of face.
304	0.40	4.04	16.10	68.74	10.72	9'	East end of face.

REMARKS

LOCALITY 67. Outcrops.

LOCATION 2 mi. NW of Wernersville.
QUADRANGLE Wernersville.

Lower Heidelberg TOWNSHIP

LAT. 0.97 mi. N of 40°20'N.

LONG. 1.50 mi. W of 76°05'W

TRANSPORTATION 0.5 mi. of improved road to highway U. S. 422.

FORMATION Jacksonburg.

MEMBER

LITHOLOGY Dark-gray, thin-bedded limestone with well-developed cleavage.

STRUCTURE Bedding strikes N55°W and dips 35°W. Cleavage strikes N80°W and dips 15°S, hence the beds are overturned.

SAMPLE LOCATION AND SEQUENCE Samples are from outcrops near the top of wooded bank of Spring Creek. Sample No. 311 is older than No. 312.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
312	0.80	1.60	11.46	78.56	7.58	5'	
311	1.00	1.20	10.98	78.95	7.87	4'	

REMARKS

LOCALITY 68. Outcrops.

LOCATION 1 mile NW of Womelsdorf.
QUADRANGLE Wernersville.

Marion TOWNSHIP

LAT. 2.73 mi. N of 40°20'N.

LONG. 1.74 mi. W of 76°10'W.

TRANSPORTATION Near new location of highway U. S. 422.

FORMATION Jacksonburg.

MEMBER

LITHOLOGY Dark-gray, shaly limestone. Weathers to a pinkish-gray.

STRUCTURE Beds nearly horizontal. Possible slumping makes dip and strike readings unreliable.

SAMPLE LOCATION AND SEQUENCE Samples collected from scattered outcrops N. of the new highway and do not represent a sequence.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
315	0.80	1.48	11.36	79.44	6.92	—	Collected from 3 separate outcrops.
316	0.80	1.60	8.90	83.47	5.23	—	Collected from 2 outcrops near the highway.

REMARKS

LOCALITY 69. Roadcut.

LOCATION 1 mi. NW of Womelsdorf.

Marion TOWNSHIP

QUADRANGLE Wernersville.

LAT. 2.73 mi. N of 40°20'N.

LONG. 1.74 mi. W of 76°05'W.

TRANSPORTATION Adjacent to new location of highway U.S. 422.

FORMATION Jacksonburg (?)

MEMBER

LITHOLOGY Dark, blue-gray, dense, thin-bedded limestone.

STRUCTURE Beds strike N60°W and dip 25°SW.

SAMPLE LOCATION AND SEQUENCE Sample taken on the S. side of the new highway, at the E. end of the cut.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
317	0.80	1.64	10.80	79.15	7.61	6'	May possibly belong to the Jacksonburg formation.

REMARKS Lithologically similar to upper member of the Annville formation.
Chemically the rock is closer to the Jacksonburg type.

LOCALITY 70. Outcrop.

LOCATION 0.75 mi. NW of Womelsdorf.

Marion TOWNSHIP

QUADRANGLE Wernersville.

LAT. 2.66 mi. N of 40°20' N.

LONG. 1.57 mi. W of 76°10'W.

TRANSPORTATION Adjacent to new location of highway U.S. 422.

FORMATION Jacksonburg.

MEMBER Conglomerate.

LITHOLOGY Dark blue-gray, dense thin-bedded limestone.

STRUCTURE Beds strike N70°W and dip 50°SW.

SAMPLE LOCATION AND SEQUENCE Sample taken from an outcrop located in a ditch at the north side of gravel road.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
318	0.80	1.44	13.73	77.68	6.36	6'6"	Fine ls. pebble cgl. in adjacent beds.

REMARKS

LOCALITY 71. Outcrops.

LOCATION 1 mi. N of Womelsdorf.
QUADRANGLE Wernersville.

Marion TOWNSHIP

LAT. 3.16 mi. N of 40°20'N.
LONG. 1.40 mi. W of 76°10'W.

TRANSPORTATION 0.1 mile to nearest paved highway.

FORMATION Jacksonburg.

MEMBER

LITHOLOGY Dark-gray, finely crystalline, thin-bedded limestone.

STRUCTURE Beds strike N70°E and dip 42°S. Dip steepens to 65°S farther south.

SAMPLE LOCATION AND SEQUENCE Samples cut in beds exposed in floor of abandoned road. No. 319 is from farthest N. outcrop. As beds are believed to be overturned, it is younger than No. 320, which was cut from beds exposed a few yards to S.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks.
319	2.80	5.14	20.76	60.88	10.42	14'	Only 8' exposed but sample spans 14'.
320	2.10	5.04	15.00	71.69	6.17	17'	

REMARKS

LOCALITY 72. Roadside Outcrop.

LOCATION E. end of Wernersville Borough.
QUADRANGLE Wernersville.

TOWNSHIP

LAT. 0.32 mi. S of 40°20'N.
LONG. 0.47 mi. E of 76°05'W.

TRANSPORTATION Close to highway U.S. 422.

FORMATION Jacksonburg.

MEMBER

LITHOLOGY Thin-bedded, gray shaly limestone. A few beds weathered to porous shale and not included in the samples.

STRUCTURE Beds strike N75°W and dip 45°S., and are right side up.

SAMPLE LOCATION AND SEQUENCE Samples are from exposures on E. side of the street. Sample No. 327 overlies No. 326.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
327	1.40	4.86	14.46	73.85	5.43	13'	Only 8' of the 13' exposed.
326	1.40	4.48	18.56	68.94	6.62	20'	Only 12' of the total are exposed.

REMARKS

LOCALITY 73. Roadcut.

LOCATION 4 mi. NW of Reading.

QUADRANGLE Reading

LAT. 1.72 mi. S of 40°25'N.

LONG. 0.10 mi. E of 76°00'W.

Bern TOWNSHIP

TRANSPORTATION Adjacent to highway Pa. 83.

FORMATION Jacksonburg.

MEMBER

LITHOLOGY Dark-gray shaly limestone. Weathers light-gray with dark-gray carbonaceous laminae.

STRUCTURE Beds crinkled by steeply-plunging open folds. Average strike varies from N75°W to N45°W. Dip is 40° to 55°SW. Fold axes strike S80°W and plunge 15° to 25°W.

SAMPLE LOCATION AND SEQUENCE Samples were taken from E. side of the cut.

No. 328 is from the youngest bed sampled; and was taken near middle of the cut.

No's. 329 and 330 are from the N. end of the cut, and No. 330 is younger than No.329.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
328	1.40	2.92	12.66	77.58	5.44	6'6"	
330	1.40	3.10	17.42	70.80	7.28	4'	Interval between here and #328 not certain.
329	1.40	4.68	18.76	69.13	6.03	5'	

REMARKS

LOCALITY 74. Outcrop.

LOCATION 2.5 mi. N. of Topton.

QUADRANGLE Allentown West.

LAT. 2.63 mi. N of 40°30'N.

LONG. 1.78 mi. W of 75°40'W.

Maxatawny TOWNSHIP

TRANSPORTATION 0.3 mile to highway U.S 222.

FORMATION Jacksonburg

MEMBER

LITHOLOGY Dark-gray shaly limestone. Partially weathered.

STRUCTURE Beds strike N80°E and dip 25°S.

SAMPLE LOCATION AND SEQUENCE Beds are exposed in bed of an improved road.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
334	1.60	2.80	10.34	78.36	6.90	4'	

REMARKS

LOCALITY 75. Outcrop.

LOCATION 2.5 mi. N of Topton.

QUADRANGLE Allentown West

Maxatawny TOWNSHIP
LAT. 2.65 mi. N of 40°30'N.
LONG. 1.56 mi. W of 75°40'W.

TRANSPORTATION 0.2 mile of improved road to highway U.S. 222.

FORMATION Jacksonburg

MEMBER

LITHOLOGY Gray shaly limestone.

STRUCTURE Beds strike N70°E and dip 40°SE.

SAMPLE LOCATION AND SEQUENCE Beds are exposed in a ditch on the west side of the road.

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
355	1.20	4.20	12.48	75.61	6.51	2'	

REMARKS

LOCALITY 76. Outcrop.

LOCATION 3.5 mi. N of Topton.

QUADRANGLE Allentown West.

Maxatawny TOWNSHIP
LAT. 3.57 mi. N of 40°30'N.
LONG. 2.35 mi. W of 75°40'W.

TRANSPORTATION On a paved road, 1 mile to highway U.S. 222.

FORMATION Jacksonburg

MEMBER

LITHOLOGY Gray shaly limestone.

STRUCTURE The beds here are essentially horizontal.

SAMPLE LOCATION AND SEQUENCE Outcrop in bank on the north side of the road.

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
356	1.60	3.14	10.38	78.36	6.52	3'	Weathered.

REMARKS

LOCALITY 77. Roadcut.

LOCATION 2.5 mi. N of Topton
QUADRANGLE Allentown West

Maxatawny TOWNSHIP

LAT. 2.73 mi. N of 40°30'N.
LONG. 2.67 mi. W of 75°40'W.

TRANSPORTATION On highway U.S. 222.

FORMATION Jacksonburg MEMBER

LITHOLOGY Finely crystalline, dark-gray, thin-bedded limestone. Weathers to dark-gray shaly limestone.

STRUCTURE Beds sampled are in crest of a plunging anticline broken by a normal fault. Fault is directly west of sample location.

SAMPLE LOCATION AND SEQUENCE Sample No. 357 is from cut at NE corner of the intersection and No. 358 is from the SE corner. Stratigraphic relation is uncertain.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
357	1.80	4.90	18.10	65.21	9.99	7'	Dark-gray shaly ls., weathered.
358	1.80	5.32	17.10	67.07	8.71	10'	Dark-gray finely crystalline ls. Weathered portions not included in the sample.

REMARKS

LOCALITY 78. Roadcut.

LOCATION 2 mi. NE of Kutztown.
QUADRANGLE Allentown West.

Maxatawny TOWNSHIP

LAT. 2.30 mi. N of 40°30'N.
LONG. 0.10 mi. E of 75°45'W.

TRANSPORTATION On highway U.S. 222.

FORMATION Jacksonburg. MEMBER

LITHOLOGY Dark-gray shaly limestone.

STRUCTURE Beds strike N55°E and dip 15°SE. Cleavage is fairly well developed and strikes N50°E and dips 65°SE.

SAMPLE LOCATION AND SEQUENCE Samples cut from exposure on south side of the road. No. 361 is from oldest bed exposed.

ANALYSES OF SAMPLES

No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	Remarks
359	1.80	4.30	14.74	71.10	8.06	5'9"	Highest beds exposed at E end of cut.
360	2.60	6.68	20.20	60.88	9.64	4'6"	Directly under No. 359.
361	1.90	5.44	20.60	64.52	7.54	5'	From near W end of cut. May overlap No. 360 in part.

REMARKS

LOCALITY 79. Outcrop.

LOCATION 0.5 mi. NE of Limekiln
QUADRANGLE Reading

LAT. 0.74 mi. N of 40°20'N.
LONG. 1.89 mi. E of 75°50'W.

Oley TOWNSHIP

TRANSPORTATION 0.1 mile to nearest paved road.

FORMATION Jacksonburg

MEMBER

LITHOLOGY Thin-bedded, dark-gray shaly limestone.

STRUCTURE Beds show many tight drag folds whose axes strike about N50°E and plunge 20°SW. Average strike of beds about N75°E, dipping 40°SE.

SAMPLE LOCATION AND SEQUENCE Sample from exposure in bed of an unpaved road.

ANALYSES OF SAMPLES							Remarks
No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
378	1.60	4.70	18.10	70.11	5.49	6'±	Length approximate because of drag folding.

REMARKS

LOCALITY 80. Quarry.

LOCATION 1 mi. N of Wernersville.
QUADRANGLE Wernersville

Lower Heidelberg TOWNSHIP
LAT. 0.78 mi. N of 40°20'N.
LONG. 0.11 mi. W of 76°05' W.

TRANSPORTATION 1.0 mile improved gravel road to highway U.S. 422.

FORMATION Martinsburg.

MEMBER

LITHOLOGY Dark-gray, limy shale; brown on weathered surface. Cleavage is well-developed. Fresh surfaces have a velvety luster.

STRUCTURE Beds in the quarry strike about N80°W and dip 25°S. They are right side up. A fault zone in the quarry strikes N35°E and dips 65°NW, drag of beds suggest normal movement.

SAMPLE LOCATION AND SEQUENCE Sample No. 324 overlies No. 323 in the quarry. No. 325 is from the road south of the quarry and is younger than No. 324.

ANALYSES OF SAMPLES							Remarks
No.	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
325	5.60	11.72	15.50	32.41	34.77	5'6"	
324	5.20	12.96	40.84	23.57	17.42	7'	
323	5.80	14.20	42.84	21.60	15.56	9'	

REMARKS These beds are believed to be in the transition zone at the base of the Martinsburg formation.

LOCALITY 81. OWNER

LOCATION 2.5 mi. S of West Leesport. TOWNSHIP

QUADRANGLE Reading. LAT. 0.64 mi. S of 40°25'N.

LONG. 1.31 mi. E of 76°00'W.

TRANSPORTATION 0.6 mi. to nearest paved road.

FORMATION Martinsburg (?) MEMBER

LITHOLOGY Dark-gray, limy shale, much sheared by fault movement. May be in part fault gouge.

STRUCTURE Sample from E. side (footwall) of fault, striking N18°E 75°W. Bedding obscured.

SAMPLE LOCATION AND SEQUENCE Sample from same quarry as the Beekmantown beds of locality 41. From east wall of quarry a few yards south of locality 41.

FACE HEIGHT

No.	ANALYSES OF SAMPLES						Remarks
	Fe ₂ O ₃	Al ₂ O ₃	SiO ₂	CaCO ₃	MgCO ₃	Length	
333	5.20	12.66	45.30	27.78	9.06	----	

OPERATING PROBLEMS

RESERVES

CLASSIFICATION

76°20'
40°35'

10'

5'

76°10'

PRINCIPAL LIMESTONE AREAS of BERKS COUNTY

Geology by Carlyle Gray

Pennsylvania Geological Survey

4th Series, Progress Report 136

1951



30'

15'

BETHEL,

UPPER

TULPEHOCKEN

TILDEN

UPPER BERN

JEFFERSON,

PENN

CENTER

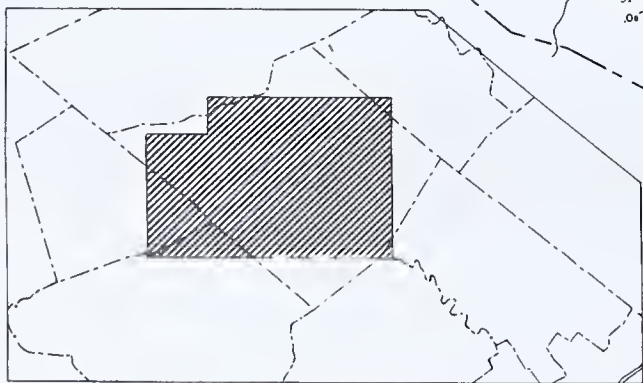
TULPEHOCKEN,

25'

MARION

NORTH HEIDELBERG

INDEX MAP



EXPLANATION

- | | | | |
|-----|---|--|-----------------------------------|
| Om | Martinsburg formation | | Thrust fault |
| Oj | Jacksonburg and Leesport formation | | Tear fault |
| Ob | Limestone conglomerate in base of Jacksonburg (Differentiated West of Robesonia only) | | High Angle fault |
| Os | Anville limestone | | Formation contact |
| Ob | Beekmantown limestone and dolomite | | Sampled quarry |
| cls | Undifferentiated Cambrian limestone | | Sampled outcrop or other exposure |
- After Stose and Wherry

Base from U.S.G.S. Lebanon, Pottsville, Reading, Hamburg, Boyertown and Allentown West Quadrangles and A.M.S. Wernersville Quadrangle with additions from aerial photographs.

N

SOUTH HEIDELBERG

SPRING

BRECKNOCK

40°15'
76°20'

15'

10'

5'

76°

